ALL INDIA COORDINATED RESEARCH PROJECT ON CASHEW

PROCEEDINGS OF THE ANNUAL GROUP MEETING OF SCIENTISTS OF AICRP-CASHEW

19-21st, JANUARY 2023

Venue : Horticultural Research Station (Dr. YSRHU)
Venkataramannagudem, Andhra Pradesh

ICAR - DIRECTORATE OF CASHEW RESEARCH
PUTTUR-574 202, D.K., KARNATAKA

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ACKNOWLEDGEMENT

The Annual Group Meeting of All India Coordinated Research Project on Cashew was held from 19 to 21st January, 2023 at Dr YSR Horticultural University, Venkataramannagudem, Andhra Pradesh. AICRP research workers and progressive farmers have participated in this meeting.

I hereby express my deep sense of gratitude to Dr. A.K. Singh, DDG (Hort. Sci.), ICAR for his kind advice and suggestions in organizing this Annual Group Meeting of Scientists of AICRP on Cashew-2022. I place on record my thanks to the authorities of the ICAR, New Delhi for their support in conducting meeting.

I am extremely thankful to Dr. V. B. Patel, ADG (Fruits and Plantation Crops), ICAR for inaugurating the AGM Meeting 2022. My thanks are due to Dr. M.R. Dinesh, Former Director, ICAR-IIHR for chairing the crop improvement session, Dr. P.C. Lenka, Former Professor, OUAT, Bhubaneswar for chairing the Crop management session and Dr. C.R. Satapathy, ICAR-Emeritus Scientist and Former Professor (Entomology) and Principal Investigator, AICRP on Honey bees and Pollinators, OUAT, Bhubaneswar for chairing the crop protection session and Dr. E. Karunasri, Director of Extension, Dr. YSRHU, V.R. Gudem for chairing the interactive session. My heartfelt thanks are also due to all the rapporteurs of different sessions.

I thank all the scientific colleagues from the coordinating centers and ICAR-DCR for their participation and cooperation in making this Annual Group Meeting a success. My sincere thanks are also due to Dr. Mohana G.S., Scientist-in-charge (PC Cell) & Smt. Reshma K, PS for their immense support extended in organizing this group meeting.

[J. DINAKARA ADIGA]
Director &
Project Coordinator (Cashew)

Puttur
Date : 6.4.2023

PROGRAMME

ANNUAL GROUP MEETING OF AICRP ON CASHEW-2022

Venue : Horticultural Research Station (Dr. YSRHU),
Venkataramannagudem, Andhra Pradesh
Date : 19 – 21st January 2023

19.1.2023 (9.30 AM)		
INAUGURAL SESSION		
Welcome Address	:	Dr. L. Naram Naidu, Director of Research, Dr. YSRHU
Invocation, ICAR Song and Lighting of lamp by dignitaries		
Project Coordinator's Report	:	Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur
Release of Publications		
Address by Chief Guest	**:**	Dr. A.K. Singh, DDG (Hort. Sci.), ICAR, New Delhi
Address by Guests of Honour	**:**	Dr. V.B. Patel, ADG (Fruits & Plantation Crops), ICAR, New Delhi
		Dr. Prabhat Kumar, Horticulture Commissioner, Government of India, New Delhi
		Dr. Venkatesh Hubballi, Director, DCCD, Kochi
Presidential Address by	**:**	Dr. T. Janakiram, VC, Dr. YSRHU, V.R. Gudem
Vote of Thanks	**:**	Dr. M. Mutyala Naidu, Organizing Secretary, Dr. YSRHU
Rapporteurs	**:**	Dr. Ashwath Narayana Reddy, Scientist (Ento), HREC, Hogalagere Dr. Meera Manjusha, Scientist (Hort), RARS, Pilicode
TECHNICAL SESSIONS		
11.30 AM		
Presentation of Action Taken Report	**:**	Dr. Mohana G.S., Pr. Scientist (Gen. & Cytogen.) and SIC (PC Cell), ICAR-DCR, Puttur
TECHNICAL SESSION-I	**:**	**CROP IMPROVEMENT**
Chairman	**:**	Dr. M.R. Dinesh, Former Director, IIHR, Bengaluru
Rapporteurs	**:**	Shri. L.S. Khapare, Scientist, RFRS, Vengurle Mrs. Asna A.C., Scientist, CRS, Madakkathara
Presentation of Reports on Crop Improvement by Scientists of AICRP-Cashew		

19.1.2023 (3.00PM)		
TECHNICAL SESSION II	**:**	**CROP MANAGEMENT**
Chairman	**:**	Dr. P.C. Lenka, Former Professor, OUAT, Bhubaneswar
Rapporteurs	**:**	Dr. Palani Kumar, Horticulturist, RRS, Vridhachalam Dr. Sundaraiya, Scientist (Hort.), RRS, Vridhachalam
Presentation of Reports on Crop Management by Scientists of AICRP Cashew		
20.1.2023 (9.30AM)		
TECHNICAL SESSION III	**:**	**CROP PROTECTION**
Chairman	**:**	Dr. C.R. Satapathy, Emeritus Professor & Former Head, OUAT, Bhubaneswar
Rapporteurs	**:**	Dr. Nagendra Reddy, Scientist (Ento.), CRS, Bapatla Dr. Nasiya Beguma A.N., Scientist (Ento.), CRS, Madakkathara
Presentation of Reports on Crop Protection by Scientists of AICRP-Cashew		
21.1.2023 (9.30 AM)		
TECHNICAL SESSION-IV **Interaction between Development Departments, Research Centers and Farmers**		
Chairman	**:**	Dr. E. Karunasri, Director of Extension, Dr. YSRHU
Rapporteurs	:	Dr. Naveen Puttaswamy, Scientist & Head, KRCCH, Kanabargi Dr. S.K. Desai, Scientist (Hort.), AES, Paria
Discussion by participants of various development departments		
Variety Release proposals		
PLENARY SESSION		
Chairman	**:**	Dr. V.B. Patel, ADG (Fruits & Plantation Crops), ICAR, New Delhi
Presentation of Rapporteur's reports	**:**	By Rapporteurs
Rapporteurs	**:**	Dr. Sreekantaprasad D, Scientist (Hort.), HRS, Hogalagere Dr. N.C. Mandawi, Scientist (Ento), SGCARS, Jagdalpur
Vote of Thanks	**:**	Dr. Mohana G.S., Scientist-in-charge, PC Cell, ICAR-DCR, Puttur

SUMMARY OF THE ANNUAL GROUP MEETING OF AICRP ON CASHEW-2022

The annual group meeting of the AICRP on cashew was held at Dr. YSR Horticulture University, Andhra Pradesh during 19 – 21st January 2023. The inaugural session was presided by Dr. T. Janakiram, Vice Chancellor, Dr. YSRHU, AP. The chief guests included Dr. A. K. Singh (Hort.Sci.) (online), Dr. V. B. Patel, ADG (Fruits & Plantation Crops), Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur, Dr. M.R. Dinesh, Former Director, IIHR, Bangalore and Dr. P.C. Lenka, Former Professor, OUAT, Bhubaneshwar. Issues such as by product utilization, high density planting, quality planting material production, management of TMB were highlighted by the DDG (Hort. Sci.). During the session, an AI based app - Cashew Protect and the database on Beneficial arthropods for cashew pollination developed by ICAR- DCR were released.

The technical session on crop improvement was chaired by Dr. M. R. Dinesh, Former Director of ICAR- IIHR, Bangalore. Recommendations pertaining to germplasm collection, register maintenance, conduct of diversity fairs, registration of germplasm with NBPGR and the progenies to be raised per cross combinations were given. Comprehensive recommendations were also given on various aspects center wise. Two varieties viz, OUAT Kalinga Cashew -1 and Bidhan Bonsai Kaju were presented for varietal release. After thorough discussion, these two varieties were recommended for release by the house.

The session on crop management was chaired by Dr. P.C. Lenka, Former Professor, OUAT, Bhubaneswar. Recommendations pertaining to cashew based cropping system, nutrient management, ultra-high density, and organic management were given center wise. The session on crop protection was chaired by Dr. C.R. Satapathy, ICAR-Emeritus Scientist and Former Professor (Entomology) and Principal Investigator, AICRP on Honey bees and Pollinators, OUAT, Bhubaneswar. Aspects such as regionally important insects and observations to be recorded in insecticide trials were discussed and recommendations were given center wise. Further, a new experiment on pollinators on cashew was approved for execution by 9 centers.

After this, interaction between development departments and research centers was held. This session was chaired by Dr. E. Karunasri, Director of Extension, Dr. YSRHU. During the session, many farmers shared their experiences in cashew cultivation, varieties of cashew, irrigation, pests, and diseases. They also demanded minimum support price for cashew by the state of Andhra Pradesh. Recommendations pertaining to minimum support price, management of pests and diseases, processing of cashew by FPOs were made during the session.

The plenary session was chaired by Dr. V.B. Patel, ADG (Fruits and Plantation crops) and the recommendations of each session were presented by the rapporteurs. Many specific recommendations and suggestions were given by the Chairman and the VC of Dr. YSR Horticultural University. The Cashew Research Station, Madakkathara was honoured with the Best AICRP center award for the year 2022.

INAUGURAL SESSION

The Annual Group Meeting of Scientists of AICRP on Cashew commenced with a welcome speech by Dr. Naram Naidu, Director of Research, YSRHU, Andhra Pradesh. Dr. T. Janakiram, Hon'ble Vice Chancellor, Dr. YSRHU, AP expressed his gratitude to Dr. Himanshu Pathak, Hon'ble Director General & Secretary DARE, ICAR New Delhi and Dr. Anand Kumar Singh, DDG (Hort.-II), ICAR, New Delhi for agreeing to conduct the AGM at the university. Dr. V. B. Patel, ADG (Fruits & Plantation Crops), Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur, Dr. M.R. Dinesh, Former Director, IIHR, Bangalore and Dr. P.C. Lenka, Former Professor, OUAT, Bhubaneshwar were present as Chief guests and subject matter experts for inaugural program.

Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur presented the Project Coordinators report. He briefed about the history and achievement of AICRP system and informed that at present 34 high yielding cashew varieties have been released for commercial cultivation in different agro-ecological regions of the country. Under crop Improvement, the total germplasm accessions conserved at various centers is 1417. A total of 35 new germplasm accessions have been collected by different centers during the year. During the year, 195 accessions for yield and yield attributing characters have been evaluated by different centres. The achievements in crop management and crop protection were also highlighted.

The cashew publications from different AICRP centers in their respective regional languages were released by all the dignitaries. In addition to these publications, Cashew protect - an AI based app developed by Dr. Mohana, G.S. and his team was released virtually by Dr. A.K. Singh, DDG (Hort.-II), ICAR, New Delhi. This AI based app and website is first of its kind in the world and in the ICAR system for cashew. It is targeted to diagnose 60 pests, 20 diseases and 10 nutritional deficiencies but at present only 6 pests and 1 disease can be easily identified with this app. The second website on 'Beneficial arthropods for cashew pollination" developed by Dr. K. Vanitha and Dr. T. N. Raviprasad, ICAR-DCR, Puttur was released by Dr. V. B. Patel, ADG, ICAR, New Delhi and other dignitaries.

Brochure on cashew protect app developed by ICAR-DCR, Puttur, 3 publications of CRS, Bapatla namely Techniques of cashew production technology (in Telugu), contributions of Dr. YSRHU in Cashew and pest management in cashew (in Telugu); and 3 publications by CRS, Madakkathara i.e. Minimum descriptors for cashew, cashew – the cash crop and cashew Calendar in Malayalam language were released. The technical bulletin on "Development of quality planting material in cashew" developed by Cashew Research Station, Bhubaneshwar in Odiya language was also released by the dignitaries.

Dr. V. B. Patel, ADG (Fruits & Plantation crops), ICAR, New Delhi addressed the gathering and he expressed his happiness in releasing the publications especially in vernacular languages so that it reaches the right stake holders. He congratulated the Director and AICRP team for the achievements made in the last year.

Dr. M.R. Dinesh, Former Director, IIHR, Bangalore remembered his association with AICRP system. He listed the advantages of AICRP that the technology gets tested at the national level from the gross root level worker. Perennial crops can be tested *in situ* even in the one tree so that lot many varieties can come up.

Dr. T. Janakiram, VC, YSRHU, AP briefed about the profile of Dr YSRHU and its research achievements. He said the new research station has been sanctioned for north coastal area focusing on cashew and coconut. He briefed about the cashew production scenario in India and in AP. He said that majority of the processing units of AP are located in Srikakulam in which research station is going to be started. He informed that 2 lakh tonnes is the cashew processing capacity of AP. He said BPP -9 and BPP-10 varieties have easier farmer acceptance since it has good yield and kernel grades. CRS, Bapatla has got recognition for producing high quality cashew grafts. He also summarised the challenges of cashew in AP. He informed regarding the attempts to promote organic cashew by the university. Identifying varieties suitable for each agroclimatic zones, replacement of non-descript varieties and senile plantations, enhancing intercrops. Integrated pest management, awareness and value addition are the way forward. He opined that use of sensors technology for TMB management and development of dwarf accessions will be boon for cashew production.

Dr. A. K. Singh, DDG (Hort. Sci.), ICAR, New Delhi who attended online said that expertise of the scientists should be utilized to address the challenges. He said that by-product utilization is another area of importance. Cashew being elevated from wasteland crop to dollar earning crop requires thorough research efforts. He reminisced the research efforts of DCR in this regard. He felt the need for exercising caution as certain crop standards are to be maintained for export-oriented crops. According to him following are some of the areas that need research focus.

Bold nut, quality of nut, dwarf plant habit for HDP, and bunch bearing habit are important aspects. Production is concentrated in three states and productivity is not on par in all states. Quality planting material production is important in this regard. Constraints like old and senile plantations, lack of planting material, unscientific management, losses due to TMB and CSRB are the challenges to overcome. Concrete recommendations should come for these challenges although promising leads are there. Accessions are to be characterized for unique characters and are to be registered with NBPGR. He said that one scientist one product should be given emphasis. Publications with high NAAS rating should come out of research efforts. Intercrop selection is critical. Abiotic stress tolerance, water use efficiency carbon sequestration potential and carbon trading values of cashew should be given thrust in research.

Basic research on pheromones for management of CSRB and TMB and emerging inflorescence pests should be another area of research. Banned pesticides are not be used and new molecules are to be recommended for farmers. Post-harvest technology and mechanization of processing along with newer technologies are another research priority for reducing drudgery. Requirement of processing sector are to be probed upon and research extension activities should be linked with export and economic aspects of cashew. Vietnam's export worth is six times that of India and to bridge the gap in our production and export, research extension and development activities are to be intensified. More remunerative technologies are to be popularized. The challenges posed by climate change, nutrition related issues, competition

from other economic crops can be mitigated by new technologies. Crop geometry alteration for HDP, newer varieties, challenges by pests and climate are to be given importance. AICRP mission is to provide tailor made solution for farmers.

He spoke about the new technology of CRISPER CAS-9 that provides ways for editing genome of rootstock which migrate to scion material. He suggested ICAR-DCR can start some initiatives in this regard. He urged that concerted efforts are required in terms of quality planting material production that can be translated to production and area increase. Handholding for minimising losses due to biotic stress and use of genetic resources are another aspect.

He congratulated DCR for AI based app. He said that premium value for organic cashew is to be bridged. Extension and research gaps in translating improved varieties in to production is to be stressed. He expressed hope in overcoming challenges with research and right technology developed with scientific approach. FPO's requirements and participatory approach in formulation of future research programmes are required. He urged for thorough examination of the work done during the AGM.

Dr. M. Mutyala Naidu expressed the vote of thanks in the end.

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PROJECT COORDINATOR'S REPORT

Dr. J. Dinakara Adiga
Director, ICAR-DCR and Project Coordinator, AICRP-Cashew

Respected Chief Guest of the today's function, the Guest of Honor and distinguished experts, scientists from AICRP-Cashew and other invitees,

I would like to express my sincere gratitude to all the dignitaries, experts, and invitees for making it convenient to be here for the Annual Group Meeting of AICRP on Cashew. I take this opportunity to express my gratefulness to Dr. A.K. Singh, DDG (Hort.) ICAR, New Delhi for permitting us to host this Annual Group Meeting of AICRP on Cashew – 2022-23 in Dr. YSR Horticultural University.

On this occasion, I am happy to present the Project Coordinator's Report. An independent All India Coordinated Research Project on Cashew was established in the year 1986 with its headquarters at the National Research Centre for Cashew at Puttur, which was renamed as ICAR-Directorate of Cashew Research during the year 2009. At present, AICRP on Cashew has 14 centers spread across the country in east coast, west coast, and plain regions.

The centers of AICRP on Cashew along with other centers working on cashew have so far developed and released 34 high yielding cashew varieties for commercial cultivation in different agro-eco-regions. The production potential of these varieties is very good and they have played a significant role in improving production of raw cashewnuts in the country. The AICRP centers are working on crop management aspects such as nutrient requirement, irrigation and high and ultra-high density planting systems. They also work on management aspects of pests such as TMB and CSRB in addition to their enumeration with respect to seasonal variations and made significant achievements.

I would like to highlight some of the salient results of the work done during the year 2022.

CROP IMPROVEMENT

The total germplasm accessions conserved at various centers is 1417. A total of 35 new germplasm accessions have been collected by different centers during the year. As far as evaluation of germplasm accessions is concerned, during the year, 195 accessions for yield and yield attributing characters have been evaluated by different centers. The trial on CNSL free accessions is under progress at Vengurle center where tender cashewnuts are in demand for culinary purposes. In the trial on performance of released varieties, BPP-8 at Bapatla and Darisai, V-7 at Hogalagere and V-4 at Jagadalpur were found to be superior.

In the trial on hybridization and selection, a total of 391 F_1 progenies were evaluated at different centers and many promising types are identified. 32 new cross combinations each

at Jagadalpur, Vengurla, Madakkathara, Goa, Vridhachalam, Bhubaneshwar and Jhargram were developed resulting in 608 F_1 progenies. A rapid clonal hybrid evaluation trial which aims at bringing desirable characters from promising germplasm accessions is under progress at Bhubaneshwar, Madakkathara, Vridhachalam and Vengurle centers. Further, the trial on evaluation of promising bold nut, bigger size apple types and high yielding cashew genotypes is under progress in ten centers. The trial on dwarf genotypes in cashew is initiated in four centers -Vengurla, Madakkathara, Pilicode and Kanabargi in the year 2022. In another six centers, it is going to start during 2023.

CROP MANAGEMENT

In the trial on nutrient management for yield maximization in cashew, recommended dose of fertilizers with FYM and foliar spray of major and minor nutrients gave best results in Bubhaneshwar and Hogalagere. In drip irrigation trial, irrigation at 80% cumulative pan evaporation was found to be the best in Jagadalpur center. In fertilizer application in high density cashew plantation experiment, 10 m x 5 m spacing and 225 kg N : 75 P_2O_5 and 75 kg K_2O per ha recorded highest yield at Hogalagere center.

The intercrop marigold at Bapatla, Turmeric at Darisai, Clusterbean at Jhargram, Colacasia at Jagadalpur, African marigold at Vridhachalam, *Gaillardia* at Kanabargi, Arrowroot at Madakkathara, Coriander at Paria, Yard long bean at Vengurle centers gave highest net returns in the intercropping experiment. In organic management trial, 100% N as vermicompost and biofertilizers gave highest nut yield in Bapatla center, whereas recommended dose of fertilizer with 10 kg FYM gave highest benefit to cost ratio in Darisai. However, 25 % N as FYM + Recycling of organic residue + in situ green manuring + Bio-fertilizers (200 g) was the best treatment at Hogalagere.

Further, the trial on ultra-high-density planting is under progress in Bapatla, Bhubaneshwar, Jhargram, Madakkathara and Vengurla centers. In Vengurla center, 3 m x 3 m spacing (2.68 t/ha) and variety V-9 (2.71 kg/tree) were found to be superior in the fourth year. In Bhubaneshwar, highest yield was recorded in 2.5 m x 2.5 m with NRCC Selection-2 variety in the third year. In Jhargram, NRCC Selection- 2 performed best in all spacings in the fourth year. The trial on pruning response of different varieties is initiated in five centers. The highest yield was observed in 25 % lateral pruning in September in Vridhachalam and Hogalagere centers. In Madakkathara and Vengurla centers, highest yield was observed in 25 % leader pruning during August month.

CROP PROTECTION

L-Cyhalothrin (0.6 ml/litre) found to be more effective compared to other insecticides against TMB, shoot tip caterpillar, apple and nut borer and leaf miner in Jagdalpur, Vengurla,

Kanabargi and Vridhachalam centers, and Thicloprid (1.5 ml/l) in Madakkathara. However, Buprofezin was found effective in Paria center. As far as botanicals are concerned, Azadirachtin 1% (1 ml/l) was found effective at Hogalagere and Kanabargi, *Datura metel* decoction @ 5 % at Jagadalpur, Neem seed kernel extract @5% at Pilicode , *Acorus calamus* @2% at Madakkathara, Botanical formulation AAVYA (4g/l) at Vengurla, spraying of combined Leaf extracts of *Adathoda, Datura, Vitex, Calotropis* and Neem at Vridhachalam were found effective against TMB with least toxicity to non-target organisms.

As far as Cashew Stem and Root Borer is concerned, Fipronil (2ml/litre) was found to be effective in Madakkathara, Vengurla and Hogalagere centers. However in Vridhachalam and Jagdalpur centers, Chloropyriphos 10ml/litre was effective. On the other hand, Imidachloprid (2ml/l) was effective in Bapatla center.

TRANSFER OF TECHNOLOGY

The coordinating centers of AICRP are also involved in transfer of technology activities and have produced about 2.02 lakh cashew grafts during 2022 which were distributed to cashew farmers, government, and non-government organizations. Frontline demonstration plots have been laid out by different centres to disseminate the recent production techniques with backup of necessary technical guidance. It is worth mentioning that the Centres of AICRP on Cashew have conducted 19 training programmes on different aspect of cashew cultivation and management practices under SCSP, TSP and other programs in which more than 2000 farmers have participated.

I sincerely hope that all scientists of AICRP-Cashew will be earnestly implementing the approved technical programmes for their centres as well as, the decisions that are taken in this Annual Group Meeting. I would like to express my deep sense of gratitude to the Hon'ble Deputy Director General (Hort. Sci.) Dr. A.K. Singh and Dr. V.B Patel, Assistant Director General (Fruits and Plantation crops) for their continued guidance and support from the Council.

Before I conclude my report, I would like to thank all my scientist colleagues of the coordinating centres of AICRP on Cashew, Directors of Research, Deans and other University authorities for extending cooperation for the effective functioning of the AICRP work in their respective centres. The financial assistance and timely help extended by Director, DCCD-Cochin, Dr. Venkatesh N. Hubballi in conducting cashew extension and development activities is gratefully acknowledged. I sincerely acknowledge the cooperation and technical support received from my colleagues at DCR, Puttur particularly Dr. Mohana G.S., Principal Scientist & Scientist-in-charge of PC Cell and Mrs. Reshma K., Private Secretary which has enabled me to smoothly run the day-to-day work of the Project Coordinator's Cell.

ACTION TAKEN REPORT ON THE DECISIONS OF AGM-2021

Action taken report on major recommendations of the Annual Group Meeting held during 5 – 6th December 2021 through online mode was presented by Dr. Mohana G.S., Sr. Scientist (Gen. & Cytogen.) & Scientist-in-charge, PC Cell, ICAR-DCR, Puttur.

Honorable DDG's suggestions	Action Taken
Development of varieties responsive to climate change Production and distribution of quality planting material Good management practices for resource maximization Scientific management of water and nutrients etc.	All the points are complied with.
Development of apps to solve the problem of pest and diseases Effective control of pests and diseases by replacing the chemicals with biological means Proper checking and validation of the technologies Technologies should be more scientific and time bound Harnessing the vast knowledge of experts in the field	An AI based app – Cashew Protect has been developed by DCR in association with AICRP scientists for identification of pests, diseases, and nutrient deficiencies.

CROP IMPROVEMENT

General Suggestions	Action Taken
Diversity map in cashew may be developed for survey and collection of germplasm	A project for distribution assessment of cashew is developed by DCR and diversity map will be prepared.
Efforts should be made for collection of trait specific and unique germplasm relying on core collection	
Joint efforts should be made for collection of germplasm from other state with due credit to the scientist or staff involved in the work	Noted and followed
Analysis of genetic variability of existing germplasm to avoided haphazard crossing	
Screening of germplasm for tolerance/resistant to different biotic and abiotic stresses should be accelerated	
In hybridization programme number of cross combinations should be less but number of crosses per combination should be more	
Experimental trials should be laid out with uniform planting material	
Director, ICAR-DCR, Puttur and PC may submit a report to ADG & DDG (Hort. Sci) for closing the non performing centers.	A comprehensive report of AICRP-Cashew with suggestions for closing non performing centers and opening new centers has already been submitted to the council

Specific Recommendations

Recommendations	Action Taken
Germplasm diversity fair needs to be conducted to obtain quality material and for promotion of farmers' variety	**Bapatla :** Farmers training programmes are being conducted regularly during the flowering and fruiting seasons in major cashew growing regions and continuous conversation with the farmers for obtaining quality germplasm. Further cashew

Recommendations	Action Taken
	germplasm diversity fair will be organized during the ensuing season to obtain the quality material. **Bhubaneshwar**: Diversity fair will be conducted during the fruiting season,2023 **Darisai**: Conversation with cashew growers and scientists are always happening to get information about the nut size, duration of flowering and yield of cashew germplasm in different areas of Jharkhand. Germplasm diversity fair planned to be conducted next year to obtain quality material and for promotion of farmers' variety. **Jhargram**: Farmers trainings are conducted on regular basis in association with state departments where farmers are informed about 'registering of farmers' variety. **Jagdalpur**: Farmer trainings are organized in the cashew growing areas. Further cashew fair will be organized with an objective to promote farmers' variety in ensuing years. **Tura**: Farmers-Scientist interaction was conducted as preparation approach for next year Germplasm diversity fair. **Vridhachalam** -Diversity fair will be conducted during the fruiting season **Madakkathara**: A diversity fair was conducted at Irikkur, Kannur as a part of Cashew Mela in March 2022 and farmers' varieties were identified for *in-situ* evaluation. **Hogalagere**: Since cashew is recently introduced crop to the area mostly with released varieties, no germplasm fairs were conducted yet. However, few patches are

Recommendations	Action Taken
	identified for availability of seed originated trees. They will be surveyed in coming flowering season. Based on preliminary result, geemplasm fair shall be conducted. **Pilicode**: During seminars and workshops conducted for farmers, special emphasis was given for display of varietal wealth by farmers. Also farmers conserving local germplasm were honoured during these programmes. Wide scale surveys were conducted based on the feedback received from these programmes. Separate germplasm fair is not conducted yet. The germplasm fair will be conducted during the peak crop season next year (April-May) **Kanabargi**: Every year during Horticulture Mela will have a separate stall for cashew to depict different cashew varieties and address farmers problems related to cashew **Goa Centre**: In the past attempts to collect the germplasm accessions were made through farmers' meets and potential germplasm collection was made. **Vengurla**: The germplasm diversity fair will be conducted during ensuing season **Paria**:
In-situ evaluation of germplasm for a minimum of three years may be encouraged to prevent collection of unwanted germplasm	**Bapatla**: Identified two germplasm lines during the year 2022 at forest plantation and marked the trees for further evaluation for its flowering behavior and yield attributes. **Bhubaneshwar**: Will be adopted in future collections. **Darisai**: *In-situ* evaluation of germplasm has been started and germplasm having similar

Recommendations	Action Taken
	behaviour of fruiting, nut size and nut yield are being discarded to prevent collection of unwanted germplasm. **Jhargram**: *In situ* evaluation will be started from next year. **Jagdalpur**: During 2022 two germplasms were selected for promising traits and locations were GPS traced and trees are marked for further evaluation. **Tura**: *In-situ* evaluation of collected germplasm has been initiated this year 2022-23. **Vridhachalam**: will be adopted in future collection **Madakkathara**: *In-situ* evaluation of three local genotypes from Kannur district is under progress **Hogalagere**: *In situ* geemplasm evaluation shall be initiated from the coming flowering season, after surveying for local geemplasm on farmers' field. **Pilicode**: Till now, *in situ* evaluation was conducted for two years before collecting germplasm. Henceforth *in situ* evaluation will be done for three years. **Kanabargi**: This year we have identified two germplasm for its bold nut size and will collect the germplasm after *in situ* evaluating it next year. **Goa**: Already this is being followed while collecting germplasm. This is the standard method to be followed routinely. **Vengurla**: *In-situ* evaluation of germplasm for a minimum of three years will be followed in future. **Paria:**

Recommendations	Action Taken
Performance of F_1 progenies from different centers may be statistically analyzed to arrive at meaningful genetical studies	**Bapatla** : F1 progenies in hybridization programme will be planted in the augmented design comparing with local checks. **Bhubaneswar**: Statistical analysis will be done after getting the data on nut yield. F1 progenies are yet to bear nuts. **Darisai**: Hybridization programme will be started in the next year. **Jhargram** : In 2021 F1 progenies were planted in augmented design , evaluation will be carried out following statistical method. **Jagdalpur**: Experiment is laid out in augmented design and F1 progenies will be compared with local and national check in ensuing years. **Tura** : Hybridization programme is yet to be taken up. **Vridhachalam**: Hybridization experiment has been initiated recently. **Madakkathara**: Hybrids will be planted in augmented design and analyzed statistically **Hogalagere**: F1s are already obtained from different crosses. Minimum number of them shall be planted in ensuing season and evaluated further. **Pilicode**: Hybridization experiments were started recently. The hybrids are in their first year. Statistical analysis will be done to arrive at a meaningful conclusion. **Kanabargi**: No hybridization trial **Goa**: **Vengurla**: All F1 progenies will be planted

Recommendations	Action Taken
	in augmented design with check variety and analyzed statistically. **Paria:**
The cashew breeders of the project may be educated on the methodologies involved in selection of parents for the improvement programme	**Bapatla**: Parents are selected based on the specific traits by duly consulting the scientists of ICAR -DCR Puttur. **Bhubaneshwar**: Parents are selected based on D2 analysis. Educated by the scientists of ICAR- DCR, Puttur, Karnataka **Darisai**: Cashew breeder will be associated with cashew project by January 2023. Parents are selected on the basis of their performance. **Jhargram**: Parents are selected on the basis of their performance and specific traits, with the expectation to combine in F1 progenies. **Jagdalpur**: Parents are selected after consulting scientists involved in cashew breeding in DCR. Further D2 cluster analysis results were utilized for selection of parents. **Tura**: Survey and collection of germplasm was carried out on the basis of unique and promising horticultural traits. **Vridhachalam:** **Madakkathara**: The parents for hybridisation programmes were selected with due consideration for characters like bold nut, cluster bearing and high yield. **Hogalagere**: As a basic plant breeder is available at the station, the services of the same shall be utilized. Some of the parents are already identified for further crossing programme.

Recommendations	Action Taken
	Pilicode: Selection of parents are being done based on presence of promising horticultural traits and high phenotypic differences. **Kanabargi**: - **Goa**: The centre has been following the selection of parents based on variability principles and even based based on molecular diversity basis. **Vengurla**: Parents for hybridization programme are selected from cashew germplasm accessions identified promising breeding lines on the basis of core analysis done by ICAR-DCR, Puttur. **Paria**
In perennial crops *in-situ* single plant evaluation for 8 years is enough for release of variety at state level.	The procedure outlined by ICAR- DCR is being followed by all centers
Molecular markers for economical trait need to be developed and studied	**Bapatla** : Molecular study for economic trait is planned and to be initiated at HRS Lam, Guntur **Bhubaneshwar**: This work will be initiated with the help of Dept. of Plant Breeding and Genetics,College of Agriculture , Bhubaneswar **Darisai**: At present facilities of molecular studies are not available in the station.Molecular study is planned to be initiated with the help of college of Biotechnology in BAU, Ranchi main campus. **Jhargram**: The study is initiated with the help of the biotechnology department of BCKV, main campus. **Jagdalpur**: Facilities in the station are not available. Collaboration with the

Recommendations	Action Taken
	Department of Plant Molecular Biology and Biotechnology at CoA, Raipur will be done for studying molecular markers for various economical traits. **Tura**: The promising germplasm identified and collected was planted in the field during this year. **Vridhachalam**: Molecular marker studies will be conducted in future **Madakkathara**: Molecular work will be initiated utilizing the facilities at College of Agriculture, Vellanikkara. **Hogalagere**: At present the station do not have facility to carry out molecular work. However, some of the molecular works are planned and will be initiated with the support of CoH Bengaluru/DCR Puttur/ IIHR. **Pilicode**: This has not been done yet. Physiologist at the station has started working on this aspect. facilities available at the station are minimal. **Kanabargi**: - - - **Goa**: Separate funds and manpower may be provided for this for Goa Centre. **Vengurla**: Molecular work will be initiated with the help of plant biotechnology centre, Dr.B.S.Konkan Krishi Vidyapeeth, Dapoli. **Paria**
Cashew apple volatile content needs to be analyzed for understanding the mechanism of tolerance /resistance of cashew to different biotic and abiotic stresses	**Bapatla** : Cashew apple volatile content will be analyzed in the next season. **Bhubaneshwar**: This is not initiated **Darisai**: Due to scarcity of scientist the

Recommendations	Action Taken
	experiment has not been started . It will be started as the scientist joins the project. **Jhargram**: This has not been initiated. **Jagdalpur**: Possibility will be explored **Tura** : This is yet to be done. **Vridhachalam**: Will be analyzed during the fruiting season **Madakkathara**: Cashew apple volatile content will be analyzed in the next season. **Hogalagere**: Since the work need high end GS-MS with head space technology and sampling needle, the possibility of analyzing cashew apple volatiles will be explored in the ensuing years. **Pilicode**: This has not been done. **Kanabargi**: - - - **Goa**: Not applicable to Goa Centre **Vengurla**: Presently, the analytical instruments required for analysis of estimation of cashew apple volatile content is not available at this centre. However it will be done next season by outsourcing. **Paria**

CENTER WISE RECOMMENDATION

Bapatla

Experiments must be concluded after completion of 6^{th} harvest or after 10^{th} year of planting.	Followed and concluded the trial at 6th harvest.
Efforts should be taken for exploration of new areas across Andhra Pradesh for collection of germplasm.	cashew germplasm collected during the 2022 season from forest plantations and agency regions of cashew growing areas.

Bhubaneshwar

Trait specific male and female parents should be selected for hybridization programme	Followed while selection of parents for crossing programme
Number of crosses may be restricted to few as per breeding objective instead of going for large number of cross combinations	Few cross combinations were selected (only 4 reciprocal cross combinations were taken during 2022 fruiting season) instead of more number of cross combinations
Care should be taken for generating more number of F_1 progenies for creating maximum variability	Efforts were taken for generating more number of F1 progenies

Darisai

Performance of the center needs to be improved	All the experiments conducted as per the Technical programme. Efforts are regularly taken to complete others assignments given in the project.

Hogalagere

Data generated from MLTs should be analysed statistically and G x E interaction effect needs to be established	Data will be analysed for GxE interaction at the final stage, before conclusion, for identified varieties of MLT entries.
Scions of required genotypes may be collected from different centers for laying out of the experiments	Currently we are collecting grafts from different centers to layout the trails as we are facing post graft mortality due to high chloride of irrigation water (prevelent problem in the entire area). Once

	the problem is solved, we shall also collect the scion of different genotypes.

Jagdalpur

Germplasm at the preliminary evaluation stage should not be subjected to statistical analysis	Noted and followed
Experiments should be maintained properly with good field boards	Noted and followed

Jhargram

Rechecking of the flower sex ratio using correct formula is to be done.	The data has been rechecked. The same ratio is recorded.
Trait specific germplasm should be collected instead of going for random collection	Germplasm is being collected based on yield, nut weight, shelling% and stress tolerance.

Kanabargi

Experiments must be concluded after completion of 6^{th} harvest or after 10^{th} year of planting	Experiments will be concluded after 6th harvest
Geo tagged photos must be used for each experiment	This year we have taken geotag photos for all experiments

Madakkathara

Grafts of genotype H-2917 should be collected from Vengurla center, which is an entry for polyclonal breeding trial	Scion sticks of H-2917 were collected from Vengurla center and grafts were planted in the field.
Germplasm descriptor should be developed and published	Germplasm descriptor for 72 accessions developed.
CNSL content of the collected germplasm needs to be quantified	CNSL content of the collected germplasm will be quantified in the next season.
Evaluation of hybrids shouldn't be reported under Gen. 1 Germplasm collection, conservation,	Evaluation of hybrids were reported under Gen.4 -

evaluation, characterization and cataloguing.	hybridisation and selection.
Hybrids identified for specific traits and suitable for registration as superior genetic stock with NBPGR, can be given a separate accession identity and included in the germplasm block.	Hybrids identified for specific traits and suitable for registration given a separate accession identity and included in the germplasm block.
A. semicarpus and *A. reniforme* may be planted at 10m x 10m / 15m x 15m, instead of 4m x 4m spacing	The wild relatives of Cashew, *Semicarpus prainii and Semicarpus kurzii* were planted at 10m x 10m.
Hybridization programme to be initiated by selecting diverse germplasm/best performers as parents. Due consideration may be given for the characters like bold nut, cluster bearing and high yield while selecting germplasm as parents.	Hybridization programme was initiated by selecting best performers with due consideration for characters like bold nut, cluster bearing and high yield.

Paria

Collect trait specific and unique germplasm instead of going for random collection	Suggestion incorporated and two varieties i.e. V-8 and V-9 from RFRS, Vengurla were collected.
All released varieties of cashew should be conserved in the gene bank	Suggestion incorporated, two varieties i.e. V-8 and V-9 were added.
Possibility of shifting experimental block to Dang district may be explored	The matter has been communicated to DR for needful.

Pilicode

Characterization and cataloguing of germplasm should be completed	The earlier trial was completed in 2016. A new trial was started in2017 with nine new germplasm accessions. These have started flowering last year only. New germplasm collection is ongoing. Collected one germplasm this year with low CNSL content.
Experiment on CNSL free types needs to be initiated at the center	This experiment was deleted for the centre Instead, trials of dwarf types of cashew was included. Planting of dwarf trial has been completed.

Tura

Based on the performance of variety Bhaskara at Tura, large scale cultivation may be promoted in the	Seedlings were raised during this year 2022-23 for grafting in the

state through KVKs	next season.
Experiments are to be properly laid out instead of haphazard planting	New Cashew Block has been initiated.
In High Density Observational trial instead of limb pruning, diagonal thinning is recommended after 6th harvest	Will be carried out
Full scape view of entire experimental plot need to be captured rather than single plant view	Noted and complied.
Year of planting should be mentioned in each experiment	Noted and complied.
Varieties need to be rechecked according to its fruit colour and other characters	Noted and complied.
The MLT trial to be started afresh with new grafted plants of uniform age	New Cashew Block has been initiated.
Director, ICAR Research Complex for NEH Region may be appraised for posting of regular staff in AICRP on Cashew, Tura center	
Carry forward the research work initiated by the scientists as the center is strategically very important for cashew research in NE region.	Noted and complied.
Recording of damage to foliage during cold season in the conserved germplasm may be explored.	The data is being recorded.

Goa

Promising varieties may be recommended for release either through SVRC or CVRC	Promising selections viz. Tudal-1 and HB-21/05 are short listed for submitting the proposals to SVRC, Goa, the details of which will be submitted to the PC, AICRP(Cashew) shortly.

Vengurla

Experiment on germplasm RFRS -195 needs to be concluded as it has completed 6 harvests	Experiment on germplasm RFRS -195 is concluded and it is included in the minimum descriptor of cashew Catalogue-II.
Germplasm descriptor should be developed and published	Catalogue-II of minimum descriptor of cashew germplasm accessions for 86 genotypes is published in 2021-22.
F_1 progenies shouldn't be included in the germplasm	F1 progenies are not included in

conservation block, unless they are given a unique identity and identified for registration as superior genetic stock with NBPGR.	the germplasm conservation block.

Vridhachalam

Germplasm characterization and cataloguing is to be completed	All the germplasm accession are newly planted
F_1 progenies evaluated since 2005 must be concluded	The trial has been concluded
The concluded report should be submitted to DCR, Puttur	Pooled data analysis is under progress and will be submitted
Initiation of new hybridization programme involving trait specific genotypes	All the germplasm accessions are newly planted during 2021 The germplasm are under vegetative stage.
The plants of Rapid Poly Clonal hybrid evaluation trial need to be caged to avoid cross pollination from outside	Caging was completed to develop Rapid Poly Clonal hybrid
The scientists of the center are advised to contact PC Cell for implementation of trials	Followed
Trial on CNSL free genotypes may be taken up	The trial has been changed to Development of cashew based cropping system. The trail will be initiated during the ensuing season
The local germplasm conserved at the center may be explored for identification of trait specific parental lines	Collected local germplasm of cashew were planted in the field. The plants are in juvenile stage.
Hybrid HC-6 with semi-dwarf habit may be taken up for high density planting.	Grafts of HC-6 were distributed to the farmers and to different AICRP centers for trial on Dwarf genotypes.
Hybrid HC-10 may be considered for varietal release/MLT at different centers	HC-10 grafts were multiplied and will be distributed.

CROP MANAGEMENT

General recommendations	**Action Taken**
The results of each experiments across various centers may be compiled	The results of the concluded trials are compiled
In the experiment, on intercropping in cashew, the	Noted and followed

crops taken under cashew need to be grown as sole crop and compared with the intercropping system. Under Ultra High Density Planting experiment, Spacing and varieties (NRCC- 2 and VRI- 3) should be uniform for all the centers as recommended by ICAR-DCR. Correlation studies are required to be studied for yield and biomass production in UHDP experiment. Soil analysis should be carried out in all experiment before laying out the experiments In nutrient management trials, soil analysis should be carried out on regular basis every year While compiling the data in nutrient experiments after the completion of the experiments the Physio – Chemical – Biological analysis to be included.	

Bapatla

B:C ratio values to be checked	checked the B: C ratio and no change was observed.
In high density observational trial, instead of limb pruning, diagonal thinning is recommended after 6th harvest	Followed and practiced the diagonal thinning.
The HDP observational trial should be concluded and report should be submitted to ICAR-DCR, Puttur.	Concluded the trial and report submitted to PC Cell, ICAR-DCR Puttur.

Bhubaneswar

Organic matter and pH should not be mentioned as available nutrient and, Leaf nutrient contents should be in percentage.	Noted and followed

Darisai

Under split plot design, mean of main and sub plot effect should be presented in the table.	Layout and data recording done as per instruction.

Under Organic management trial specify T8 treatment as check.	Incorporated as instructed.
The photographs should be geo tagged.	Geo tagged photos were taken.

Hogalagere

In organic management trial the nutrient status of the manures applied should be measured, nutrients removed by leaf litter and recycled should be calculated.	It will be presented in ensuing AGM
Economics of organic management trial should be calculated.	It will be presented in ensuing AGM
The centre has to take guidance from DCR Puttur for nutrient analysis in organic trial.	The work will be attended and suggestion will be taken from DCR Puttur for further analysis.
In the trial on fertilizer application in high density cashew plantations, mean of main and sub plot effect should be presented in the table along with interaction effect. In Drip irrigation trial soil moisture distribution pattern has to be studied and economics to be worked out.	The main, sub and interaction effects will be presented in the ensuing AGM. Soil moisture distribution shall be recorded once dry spell sets in.

Jagdalpur

In High density planting - observational trial, T-test should be done for explaining the statistical significance.	T-test was performed and results will be presented.
In drip irrigation trial, growth parameters should be recorded in initial years and presented.	Growth parameters were recorded before imposing the treatments.

Jhargram

Inter cropping experiment should be initiated in Cashew planted under wider spacing.	The experiment under wider spacing (6m X6m) has been initiated in 2022, the intercrops are yet to be harvested. The data on intercrops under 4m X4m spacing, which were harvested till in January 2022 will be presented in AGM 2022.
Soil analysis may be carried out in UHDP system to get the reason for low yield.	Soil analysis has been done.

Kanabargi

In intercropping trial, the data needs to be checked as the B:C ratio is more when cashew is grown as sole crop.	Due to less expenditure for cashew alone and good returns (yield) from the trees have resulted in more B:C ratio while net returns from cashew alone is less when compared to other intercrops
VRI-3, NRCC- 2 and Vengurla – 9 varieties should be included in UHDP trial.	This year we have planted all these varieties under UHDP trial
Geo tagged photos should be presented.	This year we have taken geotagged photos for all experiments

Madakkathara

The experimental results under UHDP system may be checked for CV values	The experimental results under UHDP system were verified.
In UHDP a comparison of canopy spread v/s biomass removal may be included instead of annual canopy spread and biomass removal separately.	In UHDP a comparison of canopy spread v/s biomass removal was included.
The reason for low yield under UHDP may be checked and crop management practices may be adopted accordingly	Advanced crop management practices were adopted to improve the yield.

Paria

The yield of cashew plant should be critically checked.	It was checked.
Under split plot design, mean of main and sub plot effect should be presented in the table.	Suggestion incorporated
Price of intercrop and cashew should be given in the table.	Suggestion incorporated
The experiment, on Spacing cum Fertilizer Trial should be dropped.	Dropped

Vengurla

The yield of some of the varieties in ultra-high density planting is lower than the farmer's field. Hence it was suggested to correlate the rainfall pattern and total rainfall data with the flowering and fruiting data for different varieties.	As per the suggestions rainfall pattern and total rainfall data is correlated with yield of three varieties *viz*., VRI-3, Ullal-1 and V-9 planted under ultra-high density planting at Vengurla centre. The results will be presented in AGM-2022.

Vridhachalam

Growth parameters for intercrops need not be studied.	Noted and followed
Geo tagging is necessary while presenting photographs.	Followed
The compiled report of organic management trial should be submitted to ICAR- DCR, Puttur	Sent to ICAR- DCR, Puttur
High Density Observation trial is not required as it is already standardized for the centre.	Noted.

New experiment : Development of Cashew based cropping system	Bapatla, Bhubaneshwar, Hogalagere, Jagdalpur, Jhargram, Madakkathara, Pilicode, Vengurla and Vridhachalam have taken up the trial and the details will be presented.

CROP PROTECTION

General recommendations	**Action taken**
Technical programme of the experiments should not be modified without the knowledge of PC Cell.	Noted and followed
The observation on physical parameters recorded in CSRB trial may be compiled and published.	Once the trial is concluded, it will be done.
Active principles in the effective treatments in botanical trial need to be worked out at the time of bringing out recommendation.	Once the trial is concluded, it will be done.

Bapatla

Contact Dr. K. Vanitha, Scientist (Ent.), ICAR-DCR, Puttur to develop pest distribution maps for cashew pests.	Discussed with Dr. K. Vanitha, Senior Scientist (Ent.), ICAR-DCR, Puttur and they suggested to collect large quantities of data for development of pest distribution maps for cashew. Accordingly, collection of data is under progress.
Document of different spider population occurring in cashew ecosystem	Followed and will present during AGM

Bhubaneshwar

None of the entomology trials were conducted. Officer incharge of AICRP on Cashew suggested to take up entomology trials with the help of available entomologists.	Entomology trials have been taken with the help of the entomologist from AICRP on Honeybee and Pollinators, OUAT, Bhubaneswar

Hogalagere

Record spider species occurring in cashew ecosystem other than *Oxypus sweta.* Identify them to species level by using ICAR-DCR, Puttur technical bulletin/taxonomists working in this area.	Six species of spiders are recorded on cashew, the work shall be continued.
For insect taxonomic identification make use of services of ICAR-NBAIR & UAS, Bangalore.	Used the services of UAS Bengaluru for insect identification.

Jagdalpur

In chemical control trial, observations needs to be recorded at weekly intervals for pollinators.	Noted
Cost economic analysis need to be worked out for different treatments in this trial.	Noted and followed
In botanical trial, ensure that the plant species included in the treatments should be available in surplus at the time of recommendations.	Plant species selected for the trial were available in forest and wastelands in the region.
Taxonomical identification pollinators of cashew need to be done.	Identification of pollinators will be done with help of taxonomist of NBAIR, Banglore

Kanabargi

Document different spider populations occurring in cashew ecosystem.	Spider populations will be documented
Taxonomic identification of thrips need to be done.	Identification of thrips according to its taxonomy will be done

Madakkathara

Pre-treatment data need to be recorded before taking up spray and data has to be recorded at 7 and 15 days after each spray.	Pre treatment data before taking up spray and data at 7 and 15 days after each spray were recorded
While reporting natural enemies, ensure its feeding on other host insects and those potential NEs only need to be reported.	Potential natural enemies only were reported.
Take stock of earlier workers work and re-organise the data recorded.	Earlier workers' work was studied to organize the data recorded.

Paria

The content of NAU product (in botanical trial) has to be mentioned in the treatments.	Suggestion incorporated

Pilicode

Composition of Kasaragod dwarf cow urine including microbial analysis need to be taken up to know the active principle.	Microbial count of the Kasaragod cow urine was recorded. Detailed microbial analysis could not be done due to lack of microbiologist at the station.
In trials on control of TMB trial, data must be recorded a day before treatment, 7 and 15 days after each spray separately.	Data had been recorded 15 days and 30 days after each spray. Since the variety selected was early flowering, data recording was completed.
After incorporating all the suggestions submit the data to PC cell.	The report will be submitted as part summary report

Vengurla

Pre-treatment data need to be recorded before taking up spray and data must be recorded at 7 and 15 days after each spray.	Pre-treatment data has been recorded before taking spray and data has been recorded at 7 and 15 days after each

	spray.
In chemical trial data must be re-checked especially for yield.	In a chemical control trial, the yield data has been re-checked.

INTERACTION SESSION

All AICRP centres should adopt the villages near by the research station to develop into model farms as technologies and communication are not reaching the farmers.	**Bapatla**: Under SCSP area expansion programme, regularly visiting the farmers' field and transferring the technologies. **Bhubaneswar**: Due to financial constraints, initiation could not be taken up. However, under SCSP and TSP area expansion programme, regular monitoring of cashew plantation in different villages is going on. Cashew farmers are provided the technical guidance as and when required by them. **Jhargram** : Fund is the limitation **Pilicode** : Because of fund limitations such an initiative could not be done. Technical advice and field visits were done in the five villages adopted by DCCD Kochi in Kannur district. **Madakkathara**: Potential cashew growing areas will be identified for the development of model farms. **Jagdalpur**: Area expansion programme has been taken up in the potential cashew area of the District. In future these plantations will be treated as model farm. **Hogalagere**: Villages around station are adopted for Technology dissemination including cashew under SCSP **Goa Centre**: Already demonstration model plots are established in Farmers field in South Goa and North Goa districts. **Vengurla**: Under the SCSP area expansion

	programme, the scientist of AICRP, cashew constantly visited the plots of beneficiary farmers and guided them regarding care and maintenance of the planted cashew grafts.
Discourage the plantation of single variety in cashew growing regions.	**Bapatla**: Encouraging the farmers to take up the 2-3 varieties consisting early, mid and late varieties. **Bhubaneswar**: Advised the farmers to plant different varieties in order to escape from high and low temperature injury during flowering and fruiting. **Jhargram**: It is always advised to the farmers to grow multi variety plantations including early, mid and late varieties to escape climatic hazards. **Kanabargi**: we try to supply few grafts of other varieties along with V-4 to the farmers. **Pilicode**: Multi variety plantations are being encouraged and farmers are advised to take up mix of early, mid, late varieties in the proportion of 20:60:20 to escape the climate vagaries. Centre also produce and distribute varieties like early varieties like Madakkathara 1, mid season varieties like, Priyanka, Raghav, Angha and Late varieties like Sulabha. **Goa Centre**: Goa Centre was the first to propose this concept during AICRP (C) AGM for which Dr Venkatesh Hubballi, Director, DCCD, initially questioned me about the availability of grafts of other varieties. However, already this is included in our recommendations and communicated the same to Directorate of Agriculture, Govt. of Goa too, besides practicing ourselves during advisory services. **Madakkathara**: Planting of three or more cashew varieties having the same flowering

	time is encouraged in commercial plantations. **Jagdalpur**: Centre will encourage plantation of two or more varieties in the region. The demand of V-4 is more, thus varieties with similar characteristics will be supplied to the farmers. **Hogalagere**: Advising the farmers to go for multi varieties. **Vengurla**: Farmers are encouraged to plant more than one cashew varieties while supplying planting material from this centre.
Cashew apple should be made as a part of nutritional mix which can be included in mid day meal programme	**Bapatla**: Regular training programmes on cashew apple utilization being conducted at KVKs of our University. **Bhubaneswar**: Training programme on cashew apple utilization are conducted regularly by OSCDC, Bhubaneswar with association of OUAT scientists to create awareness of the nutritional value of cashew apple. **Jhargram**: The programme has not been taken up. **Kanabargi**: Training programmes have been conducted at KVK's and Extension units at our University. Trials on incorporation of cashew apple in banana nutrimix initiated. regular training programmes on cashew apple utilization is also being done. **Madakkathara**: The nutritional advantage of cashew apple is being popularized regularly and FPOs/FPCs were also mobilized for home scale utilization of cashew apple. The proposal for mid-day meal programme will be submitted to the concerned authority through proper

	channels. **Jagdalpur**: Communicated to Home Science resource person in KVKs. They will try to make Porridge this season. **Hogalagere**: Possibilities of utilizing the cashew apple shall be explored by considering local preferences. **Vengurla**: This centre organized a training programme on utilization of cashew apple for the unemployed women for effective utilization of cashew apple. Under this programme, people are made aware about the nutritional value of cashew apple.
Multi-cropping should be promoted in cashew for more return.	**Bapatla**: Farmers are taking up cashew with mango. **Bhubaneswar**: Cashew alongwith mango has been practised by some progressive farmers in Dhenkanal district **Jhargram**: It is practiced by the farmers of Paschim Medinipur district where irrigation in winter is available. **Kanabargi**: Few farmers have shown interest in going for cashew along with mango, Sandalwood etcs, **PIlicode**: Multicropping with pepper, banana, pineapple, teak etc are being practiced by some progressive farmers. Farmers as part of field visit of Seminar and workshops are being taken to these farms. **Madakkathara**: Multi- cropping is being promoted wherever feasible. **Jagdalpur**: Tuber and root crops are traditionally grown in the cashew plantations. Farmers also take maize, finger millet, little millet and kodo millet in initial years. However, fruit based cropping is not

	followed in cashew. **Hogalagere**: Annual crops are already being promoted along with cashew. **Vengurla**: Multicropping pattern in cashew is being promoted during training programmes organized by this centre.
Awareness should be created among farmers on planting, canopy management and pest and disease management, through the line departments.	**Bapatla**: Regularly conducting the training programmes and creating awareness on planting, canopy management and pest and disease management. communicating the monthly operations to be carried out to the line departments and Rythu bharosa Kendra(RBK) **Bhubaneswar**: Farmers' training programme on planting, canopy management pest and disease management are regularly conducted in different districts through SCSP, TSP, DCCD programme along with Horticulture and Soil Conservation department **Jhargram**: This is done regularly. **Pilicode**: This is being done as part of regular training programmes. **Madakkathara**: Awareness programmes are being regularly conducted among cashew growers through the line departments. **Jagdalpur**: District Level Seminars, Field Days are organized annually for the ground workers of the Line Department for teaching new technologies. **Hogalagere** : Regular training programmes are being conducted to create awareness on cashew production operations. **Goa Centre**: This is being followed during the interface meetings with line

	department, held two times every year (pre-kharif and pre-rabi interface meetings). **Vengurla**: Awareness among the farmers in respect of planting, canopy management and pest and disease management have been created through various training programmes and demonstrations organized by AICRP Cashew centre and agriculture department.
The high-density planting (HDP) with plant population of 400/ ha in cashew needs to be promoted on large scale in the country to increase the production and meet the internal demand.	**Bapatla**: Encouraging the progressive farmers for high density planting with technical support from the research station. **Bhubaneswar**: Some progressive cashew growers have recently started high-density planting. **Jhargram**: It will take time, as still farmers rarely follow canopy management practice. **Kanabargi**: Trial has been initiated at Kanabargi farmers will be trained once its established. **Pilicode** : HDP trial in farmers field has been initiated by KVK Kannur, with technical support from the centre. **Madakkathara**: The high density planting in cashew is being popularized. **Jagdalpur**: Farmers are less interested in HDP. Two demonstrations on HDP in farmers fields have been taken up as a model. **Hogalagere**: Since the recommended varieties for the Region are more vigorous. The HDP with other varieties need be started afresh including a trail on UHDP **Vengurla**: The observational trial on high density planting with V-7 variety has

	conducted at this centre but the yield obtained from high density plot was found very low however the trial on UHDP planting with different varieties has been initiated at this centre. Farmers will be trained once its established.
Crop insurance scheme in cashew growing areas for the farmers should be implemented	**Jhargram**: The government need to take the initiative. **Bhubaneswar**: Proposal will be given to the State Government for implementation of crop insurance scheme in cashew. **Pilicode**: initiatives in direction already started. the PI of the centre had been a part of the technical committee constituted by the ICAR for developing cashew crop insurance guidelines for Kerala. **Madakkathara**: Crop insurance scheme in cashew is under implementation by the State Agricultural department. **Jagdalpur**: Communicated to District Administration. **Hogalagere** : Cashew is not included under the insurance scheme in this region. Since the crops for Insurance scheme is selected at district level. Hence, proposal shall be sent to Dept of Horticulture, GoK to include the crop under insurance scheme. However, central agencies like cashew board may be approached to provide insurance like how Coconut board is providing. **Vengurla**: Crop Insurance Scheme in Cashew for the farmers is implemented by the state agriculture department.
Minimum support price should be fixed in cashew to encourage farmers to cultivate cashew	**Bhubaneswar**: This will be proposed to the State Government for fixing MSP for cashew.

	Jhargram: The Directorate of Horticulture, GOWB has fixed the raw cashew price in 2022 as Rs. 120/kg. But processing sector is purchasing from the farmers still at a low rate. **Pilicode**: The state government announces the procurement price by the cooperative sector which is often converted as the minimum support price for the farmers. Farmers are demanding a higher price which is not approved by the Government. **Madakkathara**: The recommendations for minimum support price will be given to the concerned authority. Every year the price fixing committee constituted under the Industry department will fix the procurement price of RCN by Kerala State Cashew Development Corporation and CAPEX. **Jagdalpur** : The minimum price of cashew nut is fixed by the Government through the "Van Dhan" scheme as forest collection. However, the price is low as it is fixed for forest plantations. **Hogalagere**: Currently farmers are getting reasonable price. MSP may be initiated at GoK level as it is policy issue.
Replanting in senile plantation should be promoted to increase the national production.	**Bapatla**: Creating awareness to the farmers for removal of old senile seedling origin plantation and go for the planting high yielding cashew grafts of the center. Forest plantations of cashew, gradually taking up with the cashew grafts of BPP-8 and BPP-9 in place of seedling origin senile plantations in Andhra Pradesh. **Bhubaneswar**: Advise the cashew growers to remove the old senile seedling plantation and planting with hybrid varieties of cashew grafts during different awareness programme.

	Old senile cashew plantations of OSCDC and Soil Conservation department has been gradually removed and planting with high yielding varieties is going on. **Jhargram**: The farmers are encouraged for replanting during the training programme. **Pilicode** : The farmers are given awareness on replanting and support is also provided by the Cashew state Agency for expansion of cashew cultivation. Local self government department also formulates such programmes. The centre support such programmes by inspecting cashew nurseries to ensure quality graft production, providing quality grafts and by offering training to the beneficiaries. **Madakkathara**: Replanting in senile plantation is being encouraged. **Jagdalpur** : Majority of the cashew area is under forest land followed by community land. The plantation taken up by watershed and MGNREGA can be replanted as per decision of District Administration and will be further promoted to farmers plantations. **Hogalagere**: Farmers are being advised to go for rejuvenation wherever necessary. **Vengurla**: Under the various training programme conducted at this centre, farmers are encouraged for removal of old, senile and seedling trees and plant high yielding cashew grafts.

VARIETY RELEASE PROPOSAL (JHARGRAM center)

The variety proposal of JGM-282 with all necessary data needs to be presented by the scientist during the AGM	It will be presented.

TECHNICAL SESSION I: CROP IMPROVEMENT

Chairman	:	Dr. M.R. Dinesh, Former Director, ICAR-IIHR, Bengaluru
Co Chairman	:	Dr. Mohana G.S., Scientist-In-charge, PC Cell
Rapporteurs	:	Mr. Khapare L.S. (Breeder), RFRS, Vengurle
		Dr. Asna A.C. (Breeder), CRS, Madakkathara

The technical session-I started with the introductory remarks by the Chairman and Director, DCR, Puttur. The general recommendations and center-wise recommendations are as follows:

Brief description of work done, and salient achievements reported

Germplasm collection has been done by most of the centres, few accessions have been reported to perform better. The work is under progress; similarly, the hybridization programme and polyclonal trials are underway.

General guidelines for carrying out the work, recording observations and other aspects connected with the implementation of the programme

- Record all the data according to the google doc format given by PC cell. This is compulsory.
- *In situ* evaluation needs to be carried out so that only those that are of better quality can be taken for conservation, characterization, and evaluation to the germplasm block.
- Accession register must be maintained by all the centres with Accession number given to the collections. A consolidated germplasm with Acc. Nos may be maintained by the PC Cell.
- A training programme may be conducted by the PC cell in collaboration with NBPGR for all the personnel under AICRP cashew engaged in crop improvement programme.
- Diversity Fairs will have to be conducted by all the centres with farmers' participation and custodian of genetic diversity will have to be identified and further efforts should be made to promote nursery entrepreneurship.
- Unique germplasm should be registered with NBPGR.
- The evaluation of germplasm should be given in a single table.
- Objectives in the breeding programme must be realistic with one or two objectives.
- PC cell may help in the selection of parents for hybridization programme.
- At least a minimum of 100 progenies must be raised per cross combination.

Centre wise Recommendations

BAPATLA

- In hybridization and selection programme, crossing must be done regularly.
- Check the tannin content of accessions evaluated for the qualities of cashew apple

BHUBANESHWAR

- Low seed germination rate of hybrid seed needs to be assessed and help of DCR, Puttur may be taken.

JHARGRAM

- Confirm the number of replications in the hybrid evaluation programme.
- Ensure the commercial viability of varieties recommended for farmers only after taking permission from PC cell.

VRIDHACHALAM

- Experiment on CNSL trial need to be initiated and should not be replaced with intercropping trial

PARIA

- Photographs of exp. MLT-V must be submitted to DCR, Puttur
- The germplasm accessions evaluated for a period of 6 years need to be concluded

PILICODE

- The CNSL content of the newly identified germplasm accession need to be quantified
- The design for germplasm experiment needs to be corrected
- In Gen 5. the juice recovery percent of the accessions need to be estimated

MADAKKATHARA

- Discard the low performing germplasm accessions from evaluation
- Photographs of bold nut sized genotype need to be sent to PC cell

VENGURLA

- The market price of tender cashew kernel needs to be recorded every year

DARISAI

- Crop improvement experiments evaluated for a period of 6 years need to be concluded

HOGALGARE

- Crop improvement experiments evaluated for a period of 6 years need to be concluded
- Initiate hybridization and selection programme and CNSL experiment.

JAGDALPUR & GOA

- Non-participation of the centre in AGM 2022 must be reported.

KANABARGI

- Increase the number of germplasm collections
- The Dhana variety under MLT-VI need to be checked

TURA

- New experiments may be initiated in consultation with PC cell
- V4 variety in germplasm may be checked for authenticity

VARIETY RELEASE PROPOSALS

PROPOSAL FOR THE RELEASE OF CASHEW C2-6(BH2-6) FOR CASHEW GROWING REGIONS OF ODISHA, BY AICRP ON CASHEW, CRS, BHUBANESWAR

1.	Name of the crop and species		:	Cashew (*Anacardium occidentale* L.)
2.	a) Name of the variety under which it is tested		:	C2-6(BH2-6)
	b) Proposed name of the variety		:	**OUAT-Kalinga Cashew-1**
3.	Sponsored by		:	Odisha University of Agriculture and Technology, Bhubaneswar-751003
4.	a)	Institution or Agency responsible for developing / identification of the variety	:	All India Coordinated Research Project on Cashew, Directorate of Research, Odisha University of Agriculture and Technology, Bhubaneswar-751003, Odisha
	b)	Developed/ identified by (Scientists actually involved in developing/ identification of variety) (vide page no.13 for details)	:	1. Dr. K. C. Mohapatra(Ex-Jr. Horticulturist), Retired 2. Dr(Mrs.) Kabita Sethi, Jr. Horticulturist 3. Dr. P. C. Lenka(Ex-Horticulturist), Retired 4. Dr. A.K. Pattnaik,(Ex-Horticulturist),Retired 5. Dr. P. Tripathy (Ex-Horticulturist) 6. Dr. S. K. Mukherjee, Ex-Jr. Entomologist, Retired 7. Dr. P. K. Panda (Horticulturist & OIC) 8. Dr. Mohana G. S., Principal Scientist, ICAR-DCR, Puttur 9. Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur 10. Dr. T. N. Raviprasad, Principal Scientist, Entomology, ICAR-DCR, Puttur 11. Dr. G. R. Rout (Prof. & Head, Dept. of Agril. Biotechnology)
5.	a)	Parentage with details of its pedigree	:	RP-2 x Kankadi • RP-2 is a cluster bearing local germplasm collection of cashew having shelling % of 30.0 to 32.0. • Kankadi is a bold nut (12.0 to 14.0g) cashew germplasm accession collected from Maharashtra.
	b)	Breeding method used	:	Hybridization and Selection
	c)	Breeding objectives	:	To evolve bold nut, cluster bearing and high yielding genotype
6.	State the variety which is most closely resembles the proposed variety in general characters		:	Madakkathara -2 in nut shape

7.	a) Whether recommended by seminar/ conference/ workshop/ state seed sub-committee / zonal meeting.	:	Due to high yield potential of the mother plant (12.4 kg tree^{-1}) at 12th harvest, the genotype C2-6 (BH2-6) was selected as one of the entry in rapid polyclonal breeding trial. This was recommended in Annual Group Meeting of Scientists of AICRP on Cashew held during 27th -29th December, 2016 at Vridhachalam, Tamil Nadu. It was also recommended to release genotype, C2-6(BH2-6) after completion of 6th harvest. This was a recommendation in Annual Group Meeting of Scientists, 2018 held at Odisha University of Agriculture and Technology, Bhubaneswar.
	b) If so, its recommendations with specific justification for the release of proposed variety	:	This variety is having medium size nut (8.5-9.5 g), kernel weight 2.5 to 2.7 g, 30.0 to 31.0% shelling with W180 kernel counts and yielding 13.73% higher yield than the check variety (BPP-8) at 6th harvest. This variety can escape the moderate outbreak of TMB as this is a late flowering type. Hence it is recommended as an alternative to BPP-8 and Balabhadra in TMB prone cashew growing areas (mostly interior districts) of Odisha. It is also suitable for cultivation in coastal tract of Odisha
	c) Specific areas of its adaptation	:	All cashew growing areas of the state
8.	Recommended ecology	:	All cashew growing regions of Odisha
9.	**Description of the accession proposed for release as variety**		
	a) Distinguishing Morphological Characteristics (09 years old plant)		
	i. Plant height	:	5.82m
	ii. Branching pattern	:	Intensive branching
	iii. Canopy	:	Medium spreading
	iv. Leaf size and shape	:	Intermediate and Obovate
	b**) Flowering and fruiting Characteristics (09 years old plant)**		
	i. No. of flowering laterals/m^2	:	24.18
	ii. Panicle shape	:	Pyramidal

	iii. Sex ratio (female to total number of flowers)	:	0.2(range 0.16 to 0.24)
	iv. Season of flowering	:	Jan. - Feb.
	v. Duration of flowering (days)	:	60.5 (range 55-65)
	vi. Season of harvest	:	April - May
	c) **Nut characteristics (09 years old plant)**		
	i. Nut weight (g)	:	8.6g (range: 8.5-9.5 g)
	ii. Number of nuts kg^{-1}	:	117-105(mean: 116)
	d) **Kernel characteristics (09 years old plant)**		
	i. Shelling %	:	30.65(range 30.0 to 31.0)
	ii. Whole kernel count lb^{-1}	:	210 W
	iii. Kernel carbohydrate (%)	:	21.6
	iv. Kernel protein (%)	:	19.9
	v. Total lipids (%)	:	42.53
	e) **Cashew apple characteristics (09 years old plant)**		
	i. Apple colour		Yellow
	ii. Apple shape		Conical-obovate
	iii. Apple weight (g)		35.0 (range30.0 to 40.0g)
	iv. Juice content (%)		61.35(range 60.0 to 70.0)
	v. TSS of juice (ºBrix)		11.4^0 brix (range 11 to 12^0 brix)
	f) **Yield characteristics (09 years old plant)**		
	i. Mean yield/plant(year mean)	:	6.78 kg (Table 2)
	ii. Highest yield/plant recorded	:	12.33 kg at 6^{th} harvest (Table 2)
	g) Maturity (range in number of days) seedling/ transplanting to flowering, seed to seed	:	Not applicable as it is a perennial
	h) Maturity group	:	Not applicable as it is a perennial
	i) Reactions to major diseases	:	Annexure-I
	j) Reactions to major pests	:	Annexure-I
	k) Agronomic features	:	Annexure-II

	l) Quality of produce of grain, forage/fiber including nutritive value where relevant	:	Already detailed under column No. 9. (d)
	m) Reactions to stress	:	Performance was observed purely under rainfed condition
10.	Description of parents of the hybrid	:	Annexure-III
11.	Yield data	:	Given under Table 1, 2, 3 & 4
12.	a) Agency responsible for maintaining breeder's stock	:	AICRP on Cashew, OUAT, Bhubaneswar
	b) No. of Scion trees (breeder stock) readily available		About 20 plants of 2years age, 4 plants of 3 years of age and 4 plants of 9 years of age
	c) Annual production of grafts at the releasing center	:	About 1000 grafts can be supplied every year
13.	Information on the acceptability of variety by farmers/ consumers/ industry	:	Readily accepted by the farmers because of high nut yield and production of uniform nuts. This variety is preferred than Balabhadra, Jagannatha and BPP-8 because of high yield and can escape the moderate outbreak of TMB.
14.	Specific recommendations, if any, for planting material production	:	Clonal propagation can be done successfully by softwood grafting.
15.	Any other pertinent information	:	Balabhadra and BPP-8 are the recommended cashew varieties of Odisha. Both the varieties are early flowering type. Hence, not suitable for cultivation in TMB prone area particularly in interior districts of Odisha. BH2-6 is a late flowering type. It can escape the moderate outbreak of TMB. Genotype, BH2-6 can be a substitute for Balabhadra and BPP-8 in TMB prone cashew growing areas of Odisha. Genotype, BH2-6 is also a bold nut type (av. nut weight 8.6) having high shelling % (30.65).
16.	Vivid presentation with the help of photographs of the variety is to be submitted by the breeder	:	Annexure V

Table 1: Mean annual nut yield and Cum. nut yield of mother plant of F_1 progeny BH2-6 (OUAT-Kalinga Cashew-1) over 14 harvest

Sl. No.	Years	Mean annual nut yield (kg plant^{-1})	Nut yield (ton. ha^{-1})	Cum. nut yield (kg plant^{-1})
1	2006	0.8	0.160	0.8
2	2007	1.5	0.300	2.3
3	2008	1.7	0.340	4.0
4	2009	2.0	0.400	6.0
5	2010	2.4	0.480	8.4
6	2011	5.0	1.000	13.4
7	2012	The plant was heavily pruned at 3ft ht.		
8	2013			
9	2014	2.2	0.440	15.6
10	2015	8.6	1.720	24.2
11	2016	12.4	2.480	36.6
12	2017	13.7	2.740	50.3
13	2018	14.6	2.920	65.1
14	2019	12.3	2.240	77.4

*Further evaluation of mother plant was not possible as the plant was completely damaged due to cyclone 'FANI' occurred on 03.05.2019.

Table 2. Mean annual nut yield (kg plant^{-1}) and cumulative nut yield (kg plant^{-1}) of F_1 progeny BH2-6 (OUAT-Kalinga Cashew-1) evaluated in replicated trial alongwith 14 other genotypes from the year 2017-2022*

Mean annual nut yield(kg plant^{-1})							Nut yield (kg plant^{-1}) (Year mean)	Cumulative nut yield (kg plant^{-1})
Genotype	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**		
B-27(BH-27)	1.01	2.82	1.26	5.3	6.46	6.5	3.89	23.35
C-30(BH-30)	1.29	2.96	2.42	6.25	7.56	9.06	4.92	29.54
D-19(BH-19)	1.56	3.61	3.86	7.45	8.16	10.72	5.89	35.36
C2-6(BH2-6)	**2.05**	**3.9**	**4.25**	**8.25**	**9.95**	**12.33**	**6.79**	**40.73**
BH-105	1.42	1.95	3.69	5.75	7.01	9.35	4.86	29.17
Bhubaneswar-1	1.45	3.23	2.28	5.4	6.39	7.04	4.30	25.79
RP-1	1.17	3.01	2.42	5.2	5.96	9.23	4.50	26.99
RP-2	**1.39**	**3.12**	**2.65**	**6.25**	**7.88**	**9.78**	**5.18**	**31.07**
M-44/3	1.17	2.89	3.02	3.25	5.1	5.38	3.47	20.81
Kankadi	**0.2**	**0.21**	**0.4**	**1.37**	**0.65**	**0.9**	**0.62**	**3.73**
VTH-711/4	0.3	0.25	0.44	3.25	1.05	1.14	1.07	6.43
NRCC Sel.-2	1.05	2.07	1.9	5.2	6.52	9.21	4.33	25.95
H-320	0.85	1.5	1.28	2.4	4.43	5.38	2.64	15.84
Dhana	1.28	3.22	3.55	6.3	7.92	10.36	5.44	32.63

BPP-8(Check)	**1.4**	**2.55**	**3.67**	**6.25**	**8.47**	**10.64**	5.50	**32.98**
Mean	**1.17**	**2.48**	**2.47**	**5.19**	**6.23**	**7.90**	-	-
SEm(±)	**0.14**	**0.13**	**0.12**	**0.20**	**0.16**	**0.52**	-	-
CD(0.05)	**0.42**	**0.40**	**0.37**	**0.63**	**0.50**	**1.57**	-	-
CV(%)	**16.80**	**7.53**	**7.00**	**5.71**	**3.76**	**9.31**	-	-

*****The genotype, BH2-6 was evaluated along with 14 other cashew genotypes following the statistical design RBD with 02 replications. The spacing adopted for evaluation was 7mx7m. All the standard package of practices were followed during evaluation. The experiment was conducted at Cashew Research Station, OUAT, Bhubaneswar.

Table 3: Comparison of yield (kg plant^{-1}) performance of BH2-6 (OUAT-Kalinga Cashew-1) with cross parents and check variety at CRS, Bhubaneswar (Planted in replicated trial in the year, 2014)

Year	RP-2	Kankadi	BH2-6 (OUAT-Kalinga Cashew-1)	Check variety (BPP-8)
1st year,2017	1.39	0.20	2.05	1.40
2nd year,2018	3.12	0.21	3.90	2.55
3rd year,2019	2.65	0.40	4.25	3.60
4th year,2020	6.25	1.37	8.25	6.25
5th year,2021	7.88	0.65	9.95	8.47
6th year,2022	9.78	0.90	12.33	10.64

Table 4: Nut yield (kg plant^{-1}) of F_1 progeny BH2-6 (OUAT-Kalinga Cashew-1) in farmers field*

No. of harvests	Name of the Farmer: Mr. Debashis Behera Village: Badhulipur, Block:Nuagaon Dist: Nayagarh (Year of planting 2014)		No. of harvests	Name of the farmer: Mr. Sanjay Mangaraj Village: Malipada , Block: Bhubaneswar, Dist: Khorda (Year of planting 2016)	
	BH2-6	**BPP-8**		**BH2-6**	**BPP-8**
1st harvest,2017	1.1	0.7	1st harvest,2018	1.7	1.1
2nd harvest,2018	2.0	1.0	2nd harvest, 2019	2.3	1.8
3rd harvest,2019	2.8	2.7	3rd harvest, 2020	4.1	3.3
4th harvest,2020	3.4	3.0	4th harveset,2021	5.3	4.5
5th harvest,2021	5.0	4.3	5th harvest,2022	7.8	6.2
6th harvest,2022	7.1	5.7			

***Non replicated. Planted in observational strip**

Annexure-I

Reaction of F_1 progeny BH2-6 (OUAT Kalinga Cashew-1) to different biotic stress (Mean of 2017 to 2019)

Genotypes	CSRB(% infested tree)	TMB (0-4 scale)	Thrips (Population/Inflorescence)	Shoot tip caterpillar (DS %)	Dieback disease (%DS)
BPP-8	26.7	3.63	15.85	21.40	0
BH2-6	25.3	2.62	14.95	15.31	0
RP-2	28.10	3.81	18.05	20.41	0.1
Kankadi	39.30	2.77	14.17	15.18	0.4

❖ DS: Damaged shoot

Annexure-II

Agronomic Practices to be adopted for the genotype BH2-6(OUAT-Kalinga Cashew-1)

Soil	:	Red and lateritic soil
Pit size	:	60cm^3 or 1m^3 depending upon depth of soil
Planting material	:	Soft wood grafts
Planting season	:	June - July
Spacing	:	7.0m x7.0m
Method of Planting	:	Application of 10kg FYM, 200g SSP and 100g of Chloropyriphos dust per pit at the time of planting
Recommended fertilizer dose	:	500:250:250g NPK $plant^{-1}$ (Five split application) 1st Year of Planting: 1/5th of recommended dose 2nd Year: 2/5 of recommended dose 3rd Year: 3/5th of recommended dose 4th Year: 4/5th of recommended dose 5th Year on wards: Full dose Ring method of application of fertilizer
After care and Management	:	Stalking of newly planted grafts Removal of sprouts below the graft joint Training at initial years of plant growth Regular pruning of dead, diseased and criss cross branches Clean cultivation
Plant protection	:	Need based application of insecticide
	:	First at flushing –Lambda-cyhalothrin (0.003%)
	:	Second at flowering –Profenophos(0.02%)
	:	Third at fruit set – Lambda-cyhalothrin (0.003%)

Annexure-III

Morphological characterization of cross parents and F_1 progeny BH2-6 (OUAT-Kalinga Cashew-1) (09 years old plant)

Sl. No.	Parameters	Parent-1 (RP-2)	Parent-2 (Kankadi)	BH2-6 (OUAT-Kalinga Cashew-1)
1.	Parents	Local Collection	Collected from Maharastra	RP-2 X Kankadi
2.	Growth habit	Upright and compact	Upright and open	Upright and compact
3.	Plant height(m)(09 years old plant)	4.35	5.10	5.82
4.	Branching pattern	Intensive	Intensive	Intensive
5.	Mean flowering panicles m^{-2}	23.12	12.75	24.18
6.	Flowering season	December to January	January to February	January to February
7.	Flowering duration	59days	46.5days	60.5days
8.	Sex ratio	0.19	0.05	0.20
9.	Ave. no. of nuts $panicle^{-1}$	10.5	1.25	5.75
10.	Ave. nut weight(g)	4.06	14.30	8.62
11.	Shelling %	32.55	24.60	30.65
12.	Apple colour	Yellow	Yellow	Yellow
13.	Apple shape	Conical obovate	Pyriform	Conical obovate
14.	Ave. apple weight(g)	31.65	72.25	35.0
15.	Juice content (%)	66.5	72.9	61.35
16.	TSS(^{0} brix)	15.17	10.15	11.4
17.	Harvesting	March to April	April to May	April to May
18.	Yield (kg $tree^{-1}$) at 6^{th} harvest	9.08	0.9	12.33
19.	Yield (ton. ha^{-1}) at 6^{th} harvest	1.81	0.18	2.46
20.	Kernel Grade	WW400	WW180	WW180

Annexure – IV

Detail Characteristic of cashew genotype BH2-6 (OUAT-Kalinga Cashew-1)

Sl. No.	Characters	Description
1.	Crop	Cashew
2.	Variety	OUAT-Kalinga Cashew-1
3.	Proposed year of release	2022
4.	Institute	AICRP on Cashew, OUAT, Bhubaneswar
5.	Pedigree	RP-2 X Kankadi
6.	Area of adoption	All cashew growing tracts of Odisha
8.	Average yield /plant(Year mean)	6.79 kg (Mean of 6 harvest)
7.	a) **Distinguishing Morphological characteristics**	
	i. Plant height (09 years old plant)	5.82m
	ii. Branching pattern	Intensive
	iii. Canopy	Medium spreading
	iv. Leaf size and shape	Large and Obovate
	b) **Flowering and fruiting Characteristics**	
	i. No. of flowering laterals/m^2 canopy	24.18 at the age of 09years
	ii. Panicle shape	Pyramidal
	iii. Sex ratio (Bisexual: Total number of flowers)	0.2 (range 0.16 to 0.24)
	iv. Season of flowering	January-February
	v. Duration of flowering (days)	60.5(range 60-70)
	vi. Season of harvest	April - May
	c) **Nut characteristics**	
	i. Nut weight (g)	8.6 (range: 8.5-9.5 g)
	ii. Number of nuts kg^{-1}	117-105(mean: 116)
	d) **Kernel characteristics**	
	i. Shelling percentage	30.65(range 30.0 to 31.0)
	ii. Whole kernel count lb^{-1}	210 W
	iii. Kernel carbohydrate (%)	21.6
	iv. Kernel protein (%)	19.9
	e) **Cashew apple characteristics**	

	i. Apple colour	Yellow
	ii. Apple shape	Conical-obovate
	iii. Apple weight (g)	35.0 (range 30.0g to 40.0g)
	iv. Juice content (%)	61.35
	v. TSS of juice (ºBrix)	11.4
	vi. Reactions to major pests	Can escape moderate outbreak of TMB
	vii) Reactions to stress	Performance was observed purely under rainfed situation
8.	Important characters	Bold nut (8.5 to 9.5g), high shelling %(30 to 31%) and can escape the moderate outbreak of TMB
	Specific recommendation	Recommended package of practices are to be followed

Score card for evaluation of cashew variety/hybrid
Table-Summary scoring data of coordinated trials

Name of proposed variety/Hybrid: BH2-6 (OUAT-Kalinga Cashew-1)

Sl. No	Characteristics	Marks	Grading						Proposed variety/ hybrid	Check 1 (Regional/ zonal)	Check 2 (National-optional)
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Score		Score
1	Yield (kg/tree)*(improvement over check variety)	10	High (>20% over check)	10	Medium (10-20%)	5	Poor (<10%)	2	5	-	
							Very Poor (-0 to -10%)	0			
2	Tree size *	5	Dwarf	5	Semi Tall	4	Tall	3	3	3	
3	Flowering duration	5	Short(<60 days)	5	Medium(60-90d)	3	Long(>90d)	2	3	3	
4	Nut weight (g)*	10	>10g	10	>7-10 g	7	<7 g	5	7	7	
5	Shelling percentage*	10	≥ 28	10	27-28	5	<27	2	10	10	
6	Apple weight	5	>100g	5	80-100g	3	<80	1	1	1	
7	Apple TSS(∘Brix)	5	>12	5	10-12	3	<10	1	3	3	
8	Juice content (%)	5	>70	5	60-70	3	<60	1	3	3	
9	Astringency in apple	5	Absence	5	Moderate	3	Presence	1	3	3	
10	Attachment of apple to nut	5	Loose	5	Intermediate	3	Tight	1	5	5	
11	Uniformity in nut size	5	>90%	5	80-90%	3	<80%	1	5	1	
12	Kernel grade	10	>W180	10	W 180-W240	7	< W 240	5	7	7	
13	Attachment of peel to kernel	5	Loose	5	Moderate	3	Tight	1	5	3	
14	Protein (%)	5	21 and above	5	<21	3			3	3	
15	Fat (%)	5	>46	5	<46	3			3	3	
16	Reaction to insect-pests	5	Resistant	5	Tolerant	3	Susceptible	2	3	3	
	Total	**100**							**69**	**58**	

1. Qualifying variety is one which has completed minimum 6 harvest data and average yield should be minimum 1.0 t/ha
2. Yield data should be subjected to statistical analysis along with a check for comparison

Weighted Score Card for Evaluation of Cashew Varieties

(Developed by Dr. Mohana, G.S.,Dr.J.D.Adiga and Dr. E. Eradasappa, ICAR- DCR, Puttur)

1) For varieties bred mainly for cashewnuts

Sl. No.	Characteristics	Score of the new variety based on cashew descriptor (A)	Score of the check variety based on cashew descriptor(B)	Weight based on importance of the character(C)	Weighted score of the new variety (A x C)	Weighted score of the check variety (B x C)
1	Cumulative Nut Yield (kg/tree) *	7	7	5	35	35
2	Nut weight (g)	7	7	4	28	28
3	Shelling Percentage	7	7	4	28	28
4	Reaction to major pest and diseases	5	5	4	20	20
5	Apple weight (g)	5	5	3	15	15
6	Tree height (m)	7	7	3	21	21
7	Tree spread (m)	5	5	3	15	15
8	Flowering and fruiting duration (days)	5	5	3	15	15
9	Attachment of nut to apple	7	7	3	21	21
10	Kernel grade	5	5	3	15	15
11	Kernel Appearance	7	7	3	21	21
12	Flowering time	7	5	3	21	15
13	Kernel Protein (%)	3	3	2	6	6
14	Kernel Fat (%)	5	5	2	10	10
15	Kernel Sugars (%)	5	5	2	10	10

16	Attachment of peel to kernel	7	5	2	14	10
17	Number of nuts per panicle	5	5	2	10	10
			Total		**Y=305**	**X=295**
Additional Characters						
18	Uniformity in nut size (to be considered only for varieties with bold nut weight > 9 g) **	5	3	1	5	3
				Grand Total	**Y=310**	**X=298**
19	Pruning responsiveness (to be considered only for ultra-high density planting systems)			4		

*Cumulative yield of 6 harvests

The percentage superiority of new variety over check variety= (Y-X)x100/X=310-298x100/298=**4.02**

Grading of new variety=Y/100=**3.1**

Grading of check variety=X/100=**2.98**

Weighted score= **Very good**

Annexure – V

Four years old plant of F_1 progeny BH2-6

Fruiting of mother plant of F_1 progeny BH2-6

Bearing nuts in cluster

Nuts of BH2-6

Apple of F_1 progeny BH2-6

Kernel of F_1 progeny BH2-6

Recommendations of the Committee :

- The name of scientist involved in development of variety needs to be revised as per the suggestion of PC Cell.
- The comparative performance of hybrid variety with its parents needs to be prepared and submitted to PC Cell, DCR, Puttur.
- DNA finger printing of hybrid variety should be done.
- The release variety as per the proforma, may be submitted to NBPGR and PPVFRA for registration.

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PROPOSAL FOR THE RELEASE OF CASHEW JGM - 282 FOR THE RED AND LATERITE ZONE OF WEST BENGAL, BY AICRP ON CASHEW, RRS, JHARGRAM

1.	Name of the crop and species		:	Cashew (*Anacardium occidentale* L.)
2.	a) Name of the variety under which it is tested		:	JGM - 282
	b) Proposed name of the variety		:	Bidhan Bansai Kaju
3.	Sponsored by		:	ICAR-DCR Puttur, Karnataka, India.
4.	a)	Institution or Agency responsible for developing / identification of the variety	:	AICRP on Cashew, Regional Research Station, Bidhan Chandra Krishi Viswavidyalaya, Jhargram , West Bengal.
	b)	Developed/ identified by (Scientists actually involved in developing/ identification of variety)	:	Dr. Mini Poduval, Dr. M.G. Nayak, Dr. Mohana, G.S., Mr. Gobinda Saha, Miss. Suparna Chakraborty
5.	a)	Parentage with details of its pedigree	:	Selection from seedling progenies of cashew maintained at the RRS, BCKV, Jhargram since 1981-82.
	b)	Source of material in case of introductions		The source of seed was from RFRS, Vengurla from the plant of A – 18/4 in 1983 - 84.
	c)	Breeding method used	:	Selection
	d)	Breeding objectives	:	To identify a pruning responsive high yielding cashew plant for high density planting.
6.	State the variety which is most closely resembles the proposed variety in general characters		:	The proposed variety dose not resembles any other variety for growth habit and flowering.
7.	a) Whether recommended by seminar/ conference/ workshop/ state seed sub-committee / zonal meeting.		:	Presented in AGM from 2011 – 2017 under Germplasm evaluation trial and it has been recently (2020 AGM) taken into consideration for MLT trial for dwarf accessions in different AICRP centres of the country.
	b) If so, its recommendations with specific justification for the release of proposed variety		:	The Germplasm is recommended on account of higher yield (11.79 Kg/plant under 6m X 6m spacing at 10th year) over the variety (Jhargram- 1). It is a highly cluster bearing having high precocity with average 21.5 nuts/panicle (Range 11 – 32). Highly responsive to pruning, shelling percentage is high, frost tolerant, It is suitable for High density and ultra high density planting. Tolerant to drought condition and easily recovered from natural calamities (Hail storm damage).
	d) Specific areas of its adaptation		:	Red and laterite zone of West Bengal.

8.	Recommended ecology	:	Cashew is hardy crop and naturally drought tolerant. The trees are capable of thriving in wastelands where no other crops can be grown in all soil types
9.	Description of the accession proposed for release as variety		
	a) Distinguishing Morphological Characteristics		Table 1 & 2 is attached
	i. Plant height	:	4m (In 6th year), 6.6 m (in 14th year) (If not pruned)
	ii. Branching pattern	:	Highly intensive
	iii.Canopy	:	Upright and Compact
	iv.Leaf size and shape	:	Large and Obovate
	b) Flowering and fruiting Characteristics		
	i. No. of flowering laterals/m^2 canopy	:	14.80 flowering laterals /m^2 (Range : 11 – 19)
	ii. Panicle shape	:	Narrowly pyramidal
	iii. Sex ratio (male to female)	:	High (0.36)
	iv. Season of flowering	:	Early February – Mid March
	v. Duration of flowering (days)	:	36 - 40 days
	vi. Season of harvest	:	April
	c) Nut characteristics		
	i. Nut weight (g)	:	4.80
	ii. Number of nuts kg^{-1}	:	208
	d) Kernel characteristics		
	i. Shelling percentage	:	33.06
	ii. Whole kernel count lb^{-1}	:	319 (W 320)
	e) Cashew apple characteristics		
	i. Apple colour		Red
	ii. Apple shape		Obovate
	iii. Apple weight (g)		34.5 g (Length – 4.5cm, Breadth 12.5 cm)
	iv. Juice content (%)		71.3 %
	v. TSS of juice (º Brix)		14
	vi) Total sugar		8.33%
	vii) Acidity		0.18%
	f) Yield characteristics		Table - 3
	i. Mean yield/plant (4th year after planting)	:	2.70 kg
	ii. Highest yield/plant recorded	:	Normal Density Planting (6m X 6m) : 14.6 kg (9th year after planting)

	j) Maturity (range in number of days) seedling/ transplanting to flowering, seed to seed	:	Not applicable as it is a perennial
	k) Maturity group	:	Early season
	l) Reactions to major diseases	:	Major diseases were not found.
	j) Reactions to major pests	:	Susceptible to sucking pests.
	k) Agronomic features (Tables 4 - 7 are enclosed for more details)		A highly pruning responsive germplasm suitable for ultra high density and high density planting systems.
	l) Reactions to stress	:	Performance was observed purely under rainfed situation. Tolerant to drought condition and easily recovered from natural calamities (Hail storm damage)
10.	m) Description of parents of the hybrid	:	Not applicable
11.	Yield data	:	[Table – 3, 7(a), 7 (b), 9 (a-d)]
12.	a) Agency responsible for maintaining breeder's stock	:	AICRP on Cashew, RRS, B.C.K.V., Jhargram, West Bengal
	b) No. of Scion trees (breeder stock) readily available		300 plants
	c) Annual production of grafts at the releasing centre	:	5000 grafts in each year.
13.	Information on the acceptability of variety by farmers/ consumers/ industry	:	Accepted by the small farmers who has less than 1 acre area. Also for growing cashew in urban parks, As it is a high yielder in stress condition also, it is a potential variety for the water scarce areas.
14.	Specific recommendations, if any, for planting material production	:	Vegetative propagation can be done successfully by softwood grafting.
15.	Any other pertinent information	:	The variety was not affected by CSRB even after limb pruning. medium internode length (1-2cm), Not affected by gummosis and frost, Field mortality is very less.
16.	Vivid presentation with the help of photographs of the variety is to be submitted by the breeder	:	Figure 1. Figure 2. Figure 3. Figure 4.

EVALUATION REPORT OF JGM - 282

Table 1. Distinguishing Morphological Characteristics of

Sl. No.	Parameters	Description
1	Canopy type	Upright and compact
2	Branching pattern	Intensive
3	Leaves	Thick, rough, broad and dark green with obovate shape
4	Initial fruit set per inflorescence	24 – 32 nuts average (Maximum 88)
5	Average fruit retention	11 – 15 nuts/panicle
6	Shape of Panicle	Narrowly pyramidal
7	Panicle length (cm)	16.5 cm
8	Panicle width (cm)	13.4 cm
9	Number of rachis per panicle	7-10
10	Number of nuts per panicle	9 – 15 nuts/panicle
11	Nut weight (g)	4.5 – 5 g
12	Nut length (cm)	3-3.2cm
13	Nut width (cm)	2-2.2cm
14	Apple colour	Red
15	Apple weight (g)	27 - 35 g
16	Apple length (cm)	4.3 - 4.5 cm
17	Apple width (cm)	3.5 – 4.5 cm
18	Shelling per cent	33.06%
19	Kernel weight (g)	1.4-1.6 g
20.	Kernel grade	W320
21.	Protein content (%)	20 – 22%

Performance of JGM – 282 under normal density (6m X 6m)

<u>without pruning planted in 2006</u>

Table - 2: Growth characters of JGM – 282 evaluated under Germplasm block

Year	Plant height (m)	Trunk girth (cm)	Canopy spread (m)			Trunk height (m)	Canopy area (m^2)	Vegetative laterals /m^2
			E-W	N-S	Average			
2010	2.70	32.00	3.27	2.85	2.65	0.90	11.35	5.30
2011	3.15	37.00	3.85	3.40	3.63	0.60	17.81	0.00
2012	4.20	46.00	5.22	4.32	4.80	1.30	27.90	8.50
2013	4.43	52.50	6.35	6.65	6.50	1.08	47.63	1.20
2014	4.80	59.50	6.95	6.55	6.80	1.40	50.60	1.00
2015	5.60	62.00	7.10	5.50	6.30	1.20	52.90	4.30
2016	5.88	67.50	7.40	7.40	7.40	1.30	68.49	0.75
2017	6.60	74.00	9.20	7.10	8.20	1.70	81.55	4.30

Table - 3 : Yield characters of JGM – 282 evaluated under Germplasm block

Year	Flowering/ m^2	Nuts/ m^2	Nuts/ Panicle	Nut Weight (g)	Apple Weight (g)	Yield/ plant (kg)	Shelling %	Yield/m^2 of canopy area (g)
2010	5.25	44.30	18.00	4.66	32.00	2.34	34.40	206.17
2011	18.50	35.75	7.50	5.00	35.00	2.70	33.80	151.60
2012	11.30	88.80	14.80	4.68	35.00	11.60	34.40	415.77
2013	15.50	76.10	15.50	4.55	31.50	12.00	32.10	251.94
2014	16.80	70.10	10.50	4.10	25.00	14.60	32.00	288.54
2015	11.50	49.00	11.50	5.00	32.40	13.00	36.20	245.75
2016	19.25	67.75	11.50	5.03	28.50	12.00	32.60	175.21
2017	11.50	19.00	11.50	5.00	20.50	7.79	36.20	95.52

** Cumulative yield : 67.89 kg (8 harvests), Kernel grade : W 320 (280- 285 kernels /454g)

Performance of JGM – 282 under UHDP (8m X 4m) planted in 2014
<u>(Data recording in 2018 – 2020)</u>

Table – 4 (a): Effect of pruning on plant height of JGM – 282 under HDP (4m X 4m) during 2018 -19

Treatment	Initial Plant height (m) (July)	Biomass removal (kg)	% of shoot removal	Plant height after pruning (July)	% Extension of shoot	Plant height at flowering (February)
Limb pruning	2.17	0.75	32.36	1.46	52.68	2.22
Tertiary pruning	2.94	0.90	14.27	2.52	29.78	3.26

Shape pruning	3.39	1.03	-5.33	3.56	23.82	4.41
No pruning	3.32	0.00	0.00	3.56	7.12	3.81
Sem±	**0.08**	**0.03**		**0.07**		**0.09**
CD at 5%	**0.21**	**0.08**		**0.18**		**0.23**
CV%	**8.63**	**14.60**		**7.90**		**8.18**

Table – 4(b): Effect of pruning on plant height of JGM – 282 under HDP (4m X 4m) during 2019 – 20

Treatment	Initial Plant height (m) (July)	Biomass removal (kg)	% of shoot removal	Plant height after pruning (July)	% Extension of shoot	Plant height at flowering (February)
Limb pruning	2.54	26.01	39.58	1.52	36.49	2.07
Tertiary pruning	3.39	29.36	23.82	2.58	23.70	3.19
Shape pruning	4.29	20.92	21.66	3.36	18.79	3.99
No pruning	3.97	0.00	0.00	3.97	2.69	4.07
Sem±	**0.07**	**1.50**		**0.07**		**0.08**
CD at 5%	**0.18**	**3.63**		**0.17**		**0.19**
CV%	**6.21**	**23.59**		**7.41**		**7.12**

Table – 5: Effect of pruning on plant spread of JGM – 282 under HDP (4m X 4m) during 2018 -19

Treatment	Initial Plant Spread (m) (July, 2018)	% of lateral shoot removed in 2018	Spread after first removal in 2018	% Extension of growth before flowering 2018	Spread after fruiting (July, 2019)	% of lateral shoot removed in 2019	Spread after second removal in 2019	% Extension growth before flowering
Limb pruning	2.20	21.65	1.72	45.33	2.64	29.07	1.87	43.93
Tertiary pruning	3.21	12.27	2.81	26.53	3.61	20.96	2.84	27.14
Shape pruning	3.99	5.88	3.76	22.84	4.80	15.93	4.03	22.89
No pruning	1.42	0.00	1.61	3.83	1.69	0.00	1.74	1.00
Sem±	0.35		0.40		0.42		0.44	
CD at 5%	0.84		0.96		1.01		1.07	
CV%	8.58		8.26		9.50		5.44	

Table - 6: Effect of pruning on growth performance of JGM – 282 under HDP (4m X 4m) during 2018 - 2020

	Trunk girth (cm)		Canopy Area (m^2)		Non Flowering laterals/m^2 (Nos.)	
Treatment	**2018-19**	**2018-19**	2019-20	2019-20	2019-20	2019-20
Limb pruning	0.34	7.40	9.17	0.39	5.16	5.36
Tertiary pruning	0.36	14.07	18.23	0.44	4.08	3.32
Shape pruning	0.40	22.75	32.68	0.52	3.77	1.83
No pruning	0.39	24.55	37.44	0.48	3.42	2.08
Sem±	0.01	0.86	0.75	0.02	0.19	0.22
CD at 5%	0.02	2.09	1.80	0.04	0.47	0.53
CV%	5.12	15.06	9.17	11.71	14.20	21.06

Table – 7(a) : Effect of pruning on Yield attributes of JGM – 282 under HDP (4m X 4m) during 2018 - 2020

	Flowering laterals /m^2		Nuts/Panicle		Apple Weight (g)		Nut Weight (g)	
Treatment	**2018-19**	**2018-19**	**2019-20**	**2019-20**	**2019-20**	**2019-20**	**2019-20**	**2019-20**
Limb pruning	2.26	8.20	7.40	4.73	28.94	22.92	5.09	4.38
Tertiary pruning	5.13	9.75	14.07	5.21	32.78	23.41	5.28	4.40
Shape pruning	3.80	10.20	22.75	5.03	35.00	25.46	5.51	4.66
No pruning	4.50	10.25	24.55	4.54	29.00	28.13	5.28	4.53
Sem±	0.26				1.10	0.62	NS	0.12
CD at 5%	0.63				2.66	1.49		0.28
CV%	19.84	NS	NS	NS	10.48	7.42		7.72

Table – 7 (b): Effect of pruning on Yield attributes of JGM – 282 under HDP (4m X 4m) during 2018 - 2020

	Shelling %		Yield/plant(kg)		Yield/ha(Kg)	
Treatment	**2018-19**	**2018-19**	**2019-20**	**2019-20**	**2019-20**	**2019-20**
Limb pruning	34.74	33.76	0.99	1.74	620.88	543.35
Tertiary pruning	31.37	31.37	3.36	3.95	2102.53	1232.05
Shape pruning	32.39	32.39	4.01	7.32	2505.98	2562.15
No pruning	33.17	32.79	4.14	10.37	2589.37	3234.61
Sem±		0.77	0.21	0.29	131.36	94.96
CD at 5%		1.87	0.51	0.71	317.86	229.77
CV%	NS	7.10	20.16	15.02	20.16	15.05

Performance of JGM – 282 under UHDP (3m X 3m) planted in 2018

Table – 8 (a) : Growth characters of 8 varieties under UHDP

Variety	Plant height (m)		Trunk girth (cm)		Spread (m)		Biomass Removal (kg)		Canopy area (m^2)	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
JGM-282	0.98	1.63	0.10	0.20	0.99	2.39	0.34	3.08	1.75	7.64
BPP-8	0.96	1.68	0.10	0.17	1.01	2.18	0.30	3.66	1.74	7.05
BJ-2	1.01	1.82	0.10	0.20	0.97	2.37	0.17	3.40	1.80	8.15
Bhaskara	1.05	1.75	0.11	0.19	1.00	2.27	0.46	4.35	1.87	7.53
Dhana	1.11	1.75	0.10	0.17	0.91	2.12	0.11	3.44	2.17	7.04
Ullal-4	1.03	1.81	0.11	0.21	1.07	2.34	0.35	3.13	1.98	7.95
VRI-3	1.05	1.82	0.10	0.18	0.92	2.30	0.36	3.95	1.69	7.99
Amrutha	1.05	1.76	0.10	0.19	0.96	2.32	0.25	6.20	1.74	7.84
Sem±	NS	NS	NS	NS	NS	NS	0.006	0.320	NS	NS
CD at 5%							0.017	0.971		
CV%	9.44	9.86	6.04	11.39	19.12	11.88	3.28	14.21	17.48	18.67

Table – 8 (b) : Growth characters of 8 varieties under UHDP

Variety	Primary Branches		Secondary branches		Shoot (nos.) per secondary branch after pruning	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21
JGM-282	6.83	6.11	13.25	17.06	3.50	7.33
BPP-8	5.50	6.00	9.83	13.50	2.67	7.50
BJ-2	5.14	7.00	11.44	17.25	2.66	5.67
Bhaskara	5.31	7.11	11.83	14.64	3.88	6.31
Dhana	4.33	6.08	8.78	14.50	2.67	5.67
Ullal-4	5.97	6.17	12.31	13.08	2.93	6.25
VRI-3	5.47	6.50	8.97	14.50	3.06	6.58
Amrutha	5.69	7.42	9.81	13.33	3.80	7.08
Sem±	NS	NS	NS	NS	0.209	0.382
CD at 5%					0.635	1.160
CV%	18.34	19.13	18.67	18.26	11.53	10.11

Table – 9(a): Yield characters of 8 varieties under UHDP

Variety	Inflorescence /plant			Nuts/panicle		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
JGM-282	16.83	41.39	29.11	9.08	10.58	9.83
BPP-8	9.75	31.34	20.54	3.33	6.21	4.77
BJ-2	11.17	81.67	46.42	2.28	4.71	3.49
Bhaskara	11.67	62.38	37.02	3.72	5.56	4.64
Dhana	8.89	25.38	17.14	2.89	3.67	3.28
Ullal-4	16.47	48.69	32.58	4.25	6.42	5.33
VRI-3	12.28	80.24	46.26	2.97	3.79	3.38
Amrutha	11.44	64.54	37.99	3.36	5.49	4.42
Sem±	1.116	4.431	NS	0.267	0.546	0.373
CD at 5%	3.384	13.440		0.811	1.655	1.246
CV%	15.692	14.093	44.952	11.616	16.285	10.769

Table – 9(b): Yield characters of 8 varieties under UHDP

Variety	Nuts/pl.			Nut weight (gm)		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
JGM-282	43.23	161.43	102.33	4.77	4.43	4.60
BPP-8	32.83	78.31	55.57	9.67	6.70	8.18
BJ-2	25.37	45.83	35.60	9.67	8.51	9.09
Bhaskara	21.83	34.19	28.01	7.73	7.73	7.73
Dhana	21.22	9.42	15.32	8.00	7.40	7.70
Ullal-4	9.57	42.00	25.79	6.87	6.86	6.86
VRI-3	25.70	43.25	34.48	6.80	5.89	6.34
Amrutha	27.22	103.69	65.45	6.33	5.23	5.78
Sem±	1.229	4.373	NS	0.232	0.196	0.478
CD at 5%	3.727	13.265		0.703	0.593	1.599
CV%	8.225	11.695	64.211	5.368	5.136	9.606

Table – 9(c): Yield characters of 8 varieties under UHDP

Variety	Apple Wt. (gm)			Kernal Wt. (gm)		
	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
JGM-282	32.67	22.00	27.33	1.52	1.45	1.48
BPP-8	60.83	53.33	57.08	2.63	2.10	2.37
BJ-2	106.40	65.83	86.12	2.17	1.85	2.01
Bhaskara	46.17	45.33	45.75	2.27	2.03	2.15
Dhana	45.43	33.23	39.33	1.33	1.35	1.34
Ullal-4	49.83	33.87	41.85	1.73	1.85	1.79
VRI-3	37.57	31.78	34.68	1.80	1.62	1.71

Amrutha	31.30	21.97	26.63	1.97	1.53	1.75
Sem±	2.148	1.476	6.031	0.172	0.133	0.111
CD at 5%	6.517	4.476	20.171	0.522	0.403	0.371
CV%	7.257	6.653	19.018	15.468	13.342	8.607

Table – 9 (d): Yield characters of 8 varieties under UHDP

Variety	Shelling %			Yield/plant (kg.)			Yield/ha. (kg.)		
	2019-20	2020-21	Pooled	2019-20	2020-21	Cumulative	2019-20	2020-21	Cumulative
JGM-282	31.75	33.19	32.47	0.21	1.18	1.39	228.96	1306.82	1535.78
BPP-8	27.23	31.52	29.38	0.32	0.52	0.84	352.93	582.43	935.36
BJ-2	22.54	21.78	22.16	0.25	0.39	0.64	272.59	433.46	706.05
Bhaskara	29.45	26.34	27.89	0.17	0.26	0.43	187.77	294.37	482.14
Dhana	16.69	18.34	17.52	0.17	0.05	0.22	188.23	54.96	243.19
Ullal-4	25.53	26.94	26.24	0.07	0.29	0.36	73.37	318.79	392.16
VRI-3	26.43	27.52	26.97	0.18	0.25	0.43	194.43	282.72	477.15
Amrutha	31.21	29.37	30.29	0.17	0.58	0.75	192.55	639.95	832.5
Sem±	2.601	2.356	1.162	0.012	0.044		13.778	49.032	
CD at 5%	7.891	7.146	3.885	0.038	0.134		41.794	148.737	
CV%	17.097	15.181	6.172	11.291	17.361		11.291	17.361	

Table 10. Package of practices for adoption

Soil	:	This variety can be grown in all types of soil of West Bengal except in alkaline soils and under waterlogged conditions.
Planting material	:	Soft wood grafts
Planting season	:	June – July
Spacing	:	It is more suitable for high density and ultra high density planting systems. High Density: 4 X 4 m = 400 plants/ha Ultra Density: 3 X 3 m = 1111 plants/ha
Recommended fertilizer dose	:	150 -50 - 50 kg/ha for ultra high density and high density planting system. First year : 1/5th , 2nd : year 2/5th , 3rd. : year :3/5^{th,} 4th year : 4/5th and 5th year onwards full dose.
Plant protection	:	Three sprays of insecticides (as need based)
	:	First at flushing - Profenophos (1.5 ml/lit)
	:	Second at flowering – Lambda cyhalothrin (0.6 ml/lit)
	:	Third at fruit set – Thiamethoxam 0.2g/lit (if required)

Table 11: Group characters

Sl. No.	Characteristics		DUS test guideline /Descriptor Code
1	Plant: Habit	Upright and Compact	3
2	Plant: Height	Tall (>4 mts)	7
3	Plant: Internodal length	medium (1-2 cm)	5
4	Plant: Spread	High (>6.0 mts)	7
5	Leaf: Colour of young leaves	Green Yellow	3
6	Leaf: Leaf shape	Obovate	2
7	Flower : Compactness of inflorescence	Compact	7
8	Flower: Shape of inflorescence	Narrowly Pyramidal	3
9	Pseudo-fruit: colour of peduncle of tender nuts	Purple	7
10	Fruit: Colour of tender nuts	Light Green	1
11	Pseudo-fruit: Mature cashew apple colour	Red	2
12	Pseudo-fruit: Cashew apple shape	Round	3
13	Pseudo-fruit : Weight of cashew apple	Medium (27 -52 grams)	5
14	Fruit: Nut weight (g)	Very High (<5g)	3
15	Fruit: Shelling Percentage (%)	High (>28%)	7
16	Seed: Kernel weight	Intermediate 1.2 – 2.5 g)	5

Table – 11(a): Comparative studies of performance of reference varieties in West Bengal

Varieties	Mean tree ht. (m)	Mean stem girth (cm)	No. of laterals / m^2	Mean canopy spread (m)		Mean canopy area (m^2)
				E-W	N-S	
Bhubaneswar 1	4.38	49.50	1.44	5.84	5.44	42.65
K-22-1	5.06	69.50	5.56	6.61	6.49	49.24
VRI - 3	4.21	51.25	5.25	5.50	6.08	40.99
BPP-8	5.06	59.00	8.56	6.41	6.64	49.48
Jhargram-1	4.09	49.50	5.81	6.00	6.28	37.34
JGM- 282	4.80	59.50	1.00	6.95	6.55	50.60

Table – 11(b): Comparative studies of performance of reference varieties in West Bengal

Varieties	Flowering duration (days)	Mean no. of panicles/ m^2	Ratio of male : bisexual flowers	Mean no. of nuts/ m^2	Mean no. of nuts/panicle
Bhubaneswar 1	62	15.19	***0.31***	61.75	11.44
K-22-1	51	8.19	***0.21***	26.56	6.44
VRI - 3	62	11.81	***0.44***	19.44	4.38
BPP-8	62	6.81	***0.21***	26.19	6.06
Jhargram1	60	19.56	***0.52***	38.06	7.25
JGM- 282	40	16.80	***0.36***	70.10	10.50

Table – 11(c): Comparative studies of performance of reference varieties in West Bengal

Varieties	Mean nut wt (g)	Mean apple wt. (g)	Shelling %	Mean annual nut yield (kg/tree)	Cum. yield (kg/tree) (for 5 Harvests)
Bhubneswar 1	4.85	37.70	34.55	13.54	28.20
K-22-1	5.90	35.38	33.49	7.87	18.35
VRI - 3	5.42	45.75	33.81	4.32	15.48
BPP-8	6.46	65.95	31.85	8.26	19.62
Jhargram1	5.50	60.80	32.73	7.80	16.63
JGM- 282	4.60	25.00	32.00	14.60	43.24

Table – 11(d): Comparative studies of performance of reference varieties in West Bengal

Characteristics	Characteristics value of candidate variety	Characteristics value of reference variety 1	Characteristics value of reference variety 2	Characteristics value of reference variety 3
	JGM- 282	**VRI - 3**	**BPP- 8**	**Jhargram – 1**
Plant height(m)	Tall (4.80m)	Tall (4.21m)	Tall (5.06m)	Tall (4.09 m)
Plant: Branching pattern	Intensive	Intensive	Extensive	Intensive
Plant: internodal length (cm)	Intermediate (1-2cm)	Intermediate (1-2cm)	Long (>2.0)	Long (>2.0)
Plant: Colour of young	Green Yellow	Green Yellow	Yellow Red	Yellow Red

leaves				
Leaf: Leaf shape	Obovate	Oblong	Obovate	Oval
Leaf: Leaf apex shape	Indented (slight notch)	Rounded	Indented	Indented
Leaf: Leaf area (cm^2)	Large	Intermediate	Large (>120)	Intermediate
Flower: Compactness of inflorescence	Compact	Loose	Loose	Loose
Flower: Shape of inflorescence	Narrowly Pyramidal	Pyramidal	Broadly Pyramidal	Pyramidal
Pseudo-fruit: colou of peduncle of tender nuts	Purple	Green	Green	Green
Fruit: Colour of tender nuts	Light Green	Green	Green	Green
Pseudo-fruit: Mature cashew apple colour	Red	Red	Yellow	Yellow
Pseudo-fruit: Cashew apple shape	Round	Conical	Obovate	Conical
Pseudo-fruit: Weight of apple (g)	Medium (27-35 g)	Medium (45 – 50g)	High (65 – 70 g)	High (50 – 55 g)
Fruit: Apple to nut ratio	Low	Medium	Medium	Medium
Fruit: Nut shape	Kidney	Kidney	Kidney	Kidney
Fruit: Nut weight (g)	Low	Intermediate	Intermediate	Intermediate
Fruit: Shell thickness (mm)	Intermediate	Intermediate	Intermediate	Thin
Fruit: Presence of Cashew Nut Shell Liquid	Present	Present	Present	Present
Fruit: Shelling percentage (%)	High (>32%)	High (>32%)	High (>32%)	High (>32%)
Seed: Kernel weight (g)	Intermediate (1.5)	Intermediate (1.8)	Intermediate (2.05)	Intermediate (1.8)
Seed: Attachment of peel to kernel	Loose	Loose	Loose	Loose

Statement of distinctness of the variety:

The variety behaves like a tall variety if not pruned and planted at a spacing of 6m X 6m with other tall varieties. The variety is a highly pruning responsive one which can be accommodated in High density, Ultra High density planting systems without much effort and labour. The new shoots arise within 15 – 20 days after pruning and pruning time can be prolonged upto September, still the plants produce inflorescence in the next February (Only the no flowering shoots will be less than pruning in July). It is an early variety. The variety is a cluster bearer with

average no of nuts 11.50 (range 9 – 15), maximum 30 – 32 nuts were counted. It has short internode length. Nut weight is low but shelling% is high.

Statement on uniformity and stability of candidate variety

The nut weight and yield are uniform over the years and it is a regular yielding variety.

Table- 1: Weighted Score Card for Evaluation of Cashew Varieties (Method 2)
(Developed by Dr. Mohana, G.S., Dr. J.D.Adiga and Dr. E. Eradasappa, ICAR- DCR, Puttur)

Sl. No.	Characteristics	Score of the new variety based on cashew descriptor (A)	Score of the check variety based on cashew descriptor (B)	Weight based on importance of the character (C)	Weighted score of the new variety (A x C)	Weighted score of the check variety (B x C)
1	Nut Yield (kg/tree) *	7	5	5	35	25
2	Nut weight (g)	1	1	4	4	4
3	Shelling Percentage	7	7	4	28	28
4	Reaction to major pest and diseases	5	3	4	20	12
5	Apple weight (g)	1	3	3	3	9
6	Tree height (m)	7	7	3	21	21
7	Tree spread (m)	3	5	3	9	15
8	Flowering and fruiting duration (days)	7	5	3	21	15
9	Attachment of nut to apple	7	7	3	21	21
10	Kernel grade	3	3	3	9	9
11	Kernel Appearance	7	7	3	21	21
12	Flowering time	5	5	3	15	15
13	Kernel Protein (%)	3	3	2	6	6
14	Kernel Fat (%)	5	5	2	10	10
15	Kernel Sugars (%)	5	5	2	10	10
16	Attachment of peel to kernel	7	7	2	14	14
17	Number of nuts per panicle	7	5	2	14	10
Grand Total					**Y= 261**	**X = 245**
Additional Characters						
Pruning responsiveness (to be considered only for ultra-high		7	5	4	28	20

density planting systems)					
			Total Score	**289**	**265**

Particulars for Comparison	**Varities Compared for UHDP**	
	Bidhan Bonsai Kaju	**VRI-3**
The percentage superiority of new variety over check variety	**9.06**	**--**
The grading of the new variety	**2.89**	**2.65**
Rating of New Variety	**Very Good**	

Table- 2: Weighted Score Card for Evaluation of Cashew Varieties under UHDP (Method 2) (Developed by Dr. Mohana, G.S., Dr. J.D.Adiga and Dr. E. Eradasappa, ICAR- DCR, Puttur)

Sl. No.	**Characteristics**	**Score of the new variety based on cashew descriptor (A)**	**Score of the check variety based on cashew descriptor (B)**	**Weight based on importance of the character (C)**	**Weighted score of the new variety (A x C)**	**Weighted score of the check variety (B x C)**
1	Cumulative Nut Yield (kg/ha) *	3	3	5	15	15
2	Nut weight (g)	1	1	4	4	4
3	Shelling Percentage	7	7	4	28	28
4	Reaction to major pest and diseases	5	3	4	20	12
5	Apple weight (g)	1	3	3	3	9
6	Tree height (m)			3		
7	Tree spread (m)			3		
8	Flowering and fruiting duration (days)	7	5	3	21	15
9	Attachment of nut to apple	7	7	3	21	21
10	Kernel grade	3	3	3	9	9
11	Kernel Appearance	7	7	3	21	21
12	Flowering time	5	5	3	15	15

13	Kernel Protein (%)	3	3	2	6	6
14	Kernel Fat (%)	5	5	2	10	10
15	Kernel Sugars (%)	5	5	2	10	10
16	Attachment of peel to kernel	7	7	2	14	14
17	Number of nuts per panicle	7	5	2	14	10
Total					**Y= 211**	**X = 199**
Additional Characters						
18	Pruning responsiveness (to be considered only for ultra-high density planting systems)	7	5	4	28	20
				Grand Total Score	**239**	**219**

Considering the weighted Score (239) the variety is considered as a good variety

Table – 3: Score card for evaluation of cashew variety
Name of proposed variety: Bidhan Bonsai Kaju (Method -1)

Sl. No	Characteristics	Marks	Grading						Proposed variety	Check 1 (Regional / zonal)	Check 2 (National-optional)
			Magnitude	Score	Magnitude	Score	Magnitude	Score	Bidhan Bonsai Kaju	Jhargram - 1	VRI- 3
1	Yield (kg/tree)*(improvement over check variety)	10	High (>20% over check)	10	Medium (10-20%)	5	Poor (<10%)	2	10	1	1
							Very Poor (-0 to -10%)	0			
2	Tree size *	5	Dwarf	5	SemiTall	4	Tall	3	3	3	3
3	Flowering duration	5	Short(<60 days)	5	Medium(60-90d)	3	Long (>90d)	2	5	3	3
4	Nut weight (g)*	10	>10g	10	>7-10 g	7	<7 g	5	5	5	5
5	Shelling percentage*	10	≥ 28	10	27-28	5	<27	2	10	10	10
6	Apple weight	5	>100g	5	80-100g	3	<80	1	1	1	1
7	Apple TSS(∘Brix)	5	>12	5	10-12	3	<10	1	5	5	3
8	Juice content(%)	5	>70	5	60-70	3	<60	1	3	5	3

9	Astringency in apple	5	Absence	5	Moderate	3	Presence	1	1	3	1
10	Attachment of apple to nut	5	Loose	5	Intermediate	3	Tight	1	3	3	3
11	Uniformity in nut size	5	>90%	5	80-90%	3	<80%	1	5	3	5
12	Kernel grade	10	>W180	10	W 180-W240	7	< W 240	5	5	5	5
13	Attachment of peel to kernel	5	Loose	5	Moderate	3	Tight	1	5	5	5
14	Protein (%)	5	21 and above	5	<21	3			5	5	5
15	Fat (%)	5	>46	5	<46	3			3	3	3
16	Reaction to insect- pests	5	Resistant	5	Tolerant	3	Susceptible	2	3	5	5
								Total in 100	**72**	**69**	**65**

Particulars for Comparison	**Varieties Compared for UHDP**	
	Bidhan Bonsai Kaju	VRI-3
The percentage superiority of new variety over check variety	9.06	
The grading of the new variety	2.89	2.65
Rating of New Variety	Very Good	

	
	

Recommendations of the Committee :

- The name of scientist involved in development of variety needs to be revised as per the suggestion of PC Cell.
- DNA finger printing of hybrid variety should be done.
- The release variety as per the proforma, may be submitted to NBPGR and PPVFRA for registration.

Programmes allotted to different Centers of AICRP on Cashew for the year – 2023-24

Programmes		Centres
Gen.1.	Germplasm collection, conservation, evaluation, characterization and cataloguing	Bapatla, Bhubhaneswar, Darisai, Hogalagere, Jagdalpur, Jhargram, Madakkathara, Paria, Pilicode, Vengurle, Vridhachalam, Kanabargi, Tura and Goa
Gen.1a.	Evaluation of germplasm accessions with low CNSL content	Bapatla, Hogalagere, Madakkathara, Vengurla and Vridhachalam
Gen. 3.	Varietal evaluation trial	
	Multilocation trial–III (earlier MLT–2002) (Planted during 2003) (To be concluded)	Hogalagere
	Multilocation trial–V (performance of released varieties) (To be concluded after 6 harvests)	Bapatla, Hogalagere and Jagdalpur
	Multilocation trial–VI (Special MLT)	Darisai, Paria, Kanabargi and Tura
Gen. 4.	Hybridization and selection	Bapatla, Bhubhaneswar, Goa, Hogalagere, Jagdalpur, Jhargram, Madakkathara, Pilicode, Vengurla and Vridhachalam
	Rapid polyclonal hybrid evaluation trial	Bapatla, Bhubhaneswar, Hogalagere, Madakkathara, Vengurla and Vridhachalam
Gen. 5.	Characterization of germplasm for cashew apple (Experiments above 10 years may be concluded)	Bapatla and Pilicode
Gen. 6	Evaluation of promising bold nut, bigger size apple types and high yielding cashew genotypes	Bapatla, Bhubaneswar, Hogalagere, Jagdalpur, Jhargram, Goa, Kanabargi, Madakkathara, Pilicode, Goa, Vengurle and Vridhachalam
Gen. 7	Trial on Dwarf genotypes in cashew	Bapatla, Bhubaneswar, Hogalagere, Jagdalpur, Jhargram, Kanabargi, Pilicode, Madakkathara, Vengurle and Vridhachalam

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TECHNICAL SESSION II : CROP MANAGEMENT

Chairman : Dr. P.C. Lenka, Former Professor, OUAT, Bhubaneswar
Co-Chairman : Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur
Rapporteurs : Dr. M. Palanikumar, Horticulturist, RRS, Vriddhachalam
Dr. K. Sundharaiya, Scientist (Hort.), RRS, Vriddhachalam

General Recommendation:

In spacing and nutrient management trial, the data on yield per plant and yield per ha is to be included (All centres).

Centre wise recommendation:

Bapatla:

1. In cashew based cropping trial the variety Amarapali may be replaced by Arka Suprabhath.
2. Early type *Mucuna* is to be used as cover crop in cashew based cropping system.
3. In organic farming trial production cost for individual treatment may be arrived and included in the table.

Bhubaneswar

1. In the results of the Ultra High Density Planting, duration of flowering has to be included.
2. Under new trial on cashew based cropping system Aonla may be replaced by Acid lime.

Darisai

1. The organic management trial may be concluded.
2. In spacing cum fertilizer management trial (Main plot and sub plot) effect must be given in the result and the trial may be concluded.
3. Production potential of newly developed varieties trial may be initiated.

Hogalagere

1. Nutrient management trial may be concluded.
2. Nutrient management in HDP trial, the data on yield/ha may be included and concluded.

Jhargram

1. The trial on production potential of newly developed cashew varieties may be concluded.
2. Intercropping trial may be concluded.
3. In UHDP trial recheck the yield data and B:C ratio and submit to PC cell, DCR, Puttur.

4. The trial on cashew based cropping system may be initiated during the year 2024 due to land scarcity.

Madakkathara

1. New board may be placed in UHDP in cashew trial.
2. Under Hort. 11 (UHDP), shelling percentage of VRI – 3 is to be rechecked.

Paria

1. In cashew based cropping system mango variety Arka Suprabhath is to be included.
2. Instead of Jack, Aonla must be included.
3. Cover crop must be included in T7.

Vriddhachalm

1. Under intercropping in cashew trial, data may be checked and resubmitted to PC cell, DCR, Puttur.

Pilicode

1. In cropping system trial, Acid lime var. Balaji must be included. For other fruit crops follow the varieties which are proposed by Madakkathara centre.

Tura:

1. Spacing cum fertilizer trial may be withdrawn.

Non reporting centres – Jagdalpur and Goa.

Programmes allotted to different AICRP Cashew centers for the year – 2023-24

Programmes		Centres
Hort.1.	Nutrient management for yield maximization in cashew.	Bhubhaneswar, Hogalagere and Paria
Hort.2.	Fertilizer application in high density cashew plantations	Hogalagere
Hort.3.	Drip irrigation trial	Bhubaneswar and Jagdalpur
Hort.4.	High density planting - observational trial	Jagdalpur
Hort.6.	Intercropping in cashew	Bapatla, Bhubaneswar, Darisai, Jagdalpur, Jhargram, Kanabargi, Madakkathara, Paria, Vengurla and Vridhachalam
Hort.7.	Organic management of cashew	Bapatla, Darisai and Hogalagere
Hort.8.	Spacing cum Fertilizer Trial	Darisai and Tura
Hort.9.	Evaluation of production potential of newly developed variety Jhargram-2 at different spacings.	Jhargram and Darisai
Hort.11.	Ultra high density cum Drip irrigation	Bapatla, Bhubaneswar, Hogalagere, Jagdalpur, Jhargram, Kanabargi, Madakkathara, Pilicode, Vengurle and Vridhachalam
Hort.12.	Pruning response of different cashew varieties	Hogalagere, Jhargram, Madakkathara, Vengurle and Vridhachalam
Hort. 13	Development of Cashew based cropping system	Bapatla, Bhubaneshwar, Hogalagere, Jagdalpur, Jhargram, Madakkathara, Pilicode, Vengurla and Vridhachalam

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TECHNICAL SESSION III : CROP PROTECTION

Chairman : Dr. C.R. Satapathy, ICAR-Emeritus Scientist and Former Professor (Entomology) and Principal Investigator, AICRP on Honey bees and Pollinators, OUAT, Bhubaneswar

Co-Chairman : Dr. T. N. Raviprasad, Principal Scientist (Entomology), ICAR- DCR, Puttur

Rapporteurs : Dr. B. Nagendra Reddy, Scientist (Ento.), CRS, Bapatla
Dr. Nasiya Beegum A. N., Scientist (Ento.), CRS, Madakkathara

During the year 2021-22, Five experiments on plant protection were allotted to different centers viz.,

Expt.1 Evaluation of insecticides for the control of Tea Mosquito Bug and other insect pests.

Expt.1a. Evaluation of botanicals for the control of Tea Mosquito Bug and other insect pests.

Expt.2 Curative Trial (Post extraction prophylaxis) for management of Cashew stem and root borer

Expt.3 Influence of biotic and abiotic factors on the incidence of pest complex of cashew

Expt.4 Screening of germplasms to locate tolerant / resistant types to major pests of the region.

During this technical session III, 8 centres presented their results.

Sl No	Name of the Station	Experiments conducted and result presented				
		Expt. 1	Expt. 1a	Expt. 2	Expt. 3	Expt. 4
1	Bapatla	√	√	√	√	√
2	Bhubaneswar	√	-	√	√	√
3	Hogalagere	-	√	√	√	√
4	Jagadalpur	-	-	-	-	-
5	Madakkathara	√	√	√	√	√
6	Paria	√	√	-	√	-
7	Vengurle	√	√	√	√	√
8	Vridhachalam	√	√	√	√	√
9	Kanabargi	√	√	-	√	-

General Recommendations:

- The centres should record all the relevant observations according to the google doc format provided by PC cell.
- While presenting the data insect pests of regional importance should be indicated. Treatments should be initiated only after pest population crossed ETL i.e. > 5.0 per cent incidence in laterals by TMB and > 5.0 per cent for other pests of the regional importance
- Along with insecticidal field trials, laboratory trials may also be conducted simultaneously to fix the LC_{50} / LD_{50} values for recommending the insecticides at the time of need.
- In insecticidal trial, to maintain the uniformity of *B. bassiana* strain ICAR-DCR, Puttur should supply the product to all the centres.
- In insecticidal trial, the observations should be recorded on 5, 7 and 15 days after insecticide application.
- In the Post extraction prophylaxis (PEP) trial, physical parameters of treated cashew trees recorded till date may be compiled and report should be submitted to the PC cell.
- In the PEP trial, insecticidal suspension used for swabbing and drenching should be 5 liters/tree for all the centres for uniformity.
- Focus on recording all regional pests only for documentation and major pests for protection trials.
- Maintain the common treatments along with same number across the different centres for easy compilation and bringing the recommendation.
- In screening of germplasm to locate tolerant/resistance types against major pests of the region trial, compile the performance of germplasm data available in respective centre and submit to PC cell
- New experiment on pollinators on cashew is approved for execution by 9 centres viz., Bapatla, Bhubaneswar, Vridhachalam, Madakkathara, Paria, Kanabargi, Hogalagere, Vengurla, Jagdalpur. Dr. K. Vanitha will provide the complete information and proforma for circulation to all the centres.

Centre wise Recommendations

BAPATLA

- Try to record other natural enemies along with spiders
- Follow the google doc format strictly

BHUBANESHWAR

- In insecticidal trial, check the recorded units for thrips, instead of population of thrips in damage scale 0-4 may be presented.
- Observation on flower thrips and leaf thrips have to be done separately
- In CSRB trial, treatments to be imposed sequentially

VRIDHACHALAM

- Check the cost of treatment application in CSRB trial
- Instead of releasing adults for residual toxicity experiment, nymphs are to be released
- Tables are too elaborate, and not visible, so it is preferable to give as graphical representations
- Specify the species of wasps encountered in different plots
- Check the data on CSRB incidence in correlation with abiotic factors in influence of biotic and abiotic factors on the incidence of pest complex of cashew

MADAKKATHARA

- Recheck B:C ratio and cost of cultivation in insecticidal trial
- Check CD and SEm± value in insecticidal trial and botanical trial
- Compile the germplasm data available in your centre and submit to the PC cell

PARIA

- Check the data on population counts/score regarding to TMB in evaluation of insecticides trial
- Check the data of buprofezin treatment in insecticidal trial.
- The information of ingredients in NOVEL the NAU product may be indicated as patent already done.
- Correlation data in influence of biotic and abiotic factors on the incidence of pest complex of cashew need to be rechecked.

KANABARGI

- Check the thrips population data (Expt. Influence of biotic and abiotic factors on the incidence of pest complex of cashew).

HOGALGARE

- Remove Treatment T6 (untreated control) in CSRB trial as it is detrimental
- Check the data on CSRB incidence in correlation with abiotic factors in influence of biotic and abiotic factors on the incidence of pest complex of cashew

PILICODE

- Take the help of entomologist while collecting and analysing of data
- Microbial profiling of Kasaragod dwarf cow urine must be done

VENGURLA

- Data to be recheck in botanical trial especially in AVYA treatment.
- Document the thrips and different spider population occurring in cashew ecosystem

JAGDALPUR

- Non-participation of the centre in AGM 2022 is to be conveyed to the SAU.

Over and above, the Chairman suggested for compilation of information available at ICAR-DCR, Puttur for a publication on changing scenario of cashew pest and pest management practices involving the scientists of all coordinating centres.

Programmes allotted to different AICRP Cashew centers for the year – 2023-24

Programmes		Centres
Ent.1. Chemical Control of pest complex in cashew.		
Expt 3. Evaluation of insecticides for the control of TMB and other insect pests		Bapatla, Bhubhaneswar, Jagdalpur, Kanabargi, Madakkathara, Paria, Vengurla and Vridhachalam.
Expt 4. Evaluation of Botanicals for the control of Tea Mosquito Bug and other insect pests		Bapatla, Hogalagere, Jagdalpur, Kanabargi, Madakkathara, Paria, Pilicode, Vengurla and Vridhachalam.
Ent. 2. Control of Cashew Stem and Root Borer		
Expt. 2. Curative trials		Bapatla, Bhubhaneswar, Hogalagere, Jagdalpur, Madakkathara, Vengurla and Vridhachalam.
Ent. 3.	Influence of biotic and abiotic factors on the incidence of pest complex of cashew	Bapatla, Bhubhaneswar, Hogalagere, Jagdalpur, Kanabargi, Madakkathara, Paria, Vengurla and Vridhachalam.
Ent. 4.	Screening of germplasm to locate tolerant / resistant types for major pests of the region	Bapatla, Bhubhaneswar, Hogalagere, Jagdalpur, Vengurla and Vridhachalam.
Ent. 5.	New experiment on pollinators on cashew.	Bapatla, Bhubaneswar, Vridhachalam, Madakkathara, Paria, Kanabargi, Hogalagere, Vengurla, Jagdalpur.

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TECHNICAL SESSION – IV : INTERACTION BETWEEN DEVELOPMENT DEPARTMENTS & RESEARCH CENTRES

Chairman : Dr. E. Karunasri, Director of Extension, Dr. YSRHU, V.R. Gudem

Rapporteur : Mr. Naveen M Puttaswamy, Assistant Professor, HREC, Kanabargi
Dr. S.K. Desai, Scientist (Hort.), AES, Paria

During the session, Dr V.B. Patel, ADG (Fruits and Plantation crops), ICAR, New Delhi, Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur, Dr. P.C. Lenka Former Professor OUAT, Bhubaneswar and Dr. L. Naram Naidu, Director of Research, Dr. YSRHU, V.R. Gudem were present. The Chairman welcomed all the delegates, scientists, officers of line Dept., Govt. of Andhra Pradesh, cashew entrepreneurs, and farmers to share their views and suggestions for development of Cashew sector in the country.

Shri. Mohan Rao, farmer from Eluru dist., expressed his view on cashew, which is a major crop in tribal area. He was happy with the performance of improved varieties of Bapatla in their area; major problem faced by them is severe incidence of CSRB and TMB. He also expressed his view on intervention of middlemen in procuring raw nuts due to which they are getting lower revenue for their produce.

Shri. Musalayya, farmer from W. Godavari district, said that organic management in cashew has increased yield of cashew in his orchard. Shri. Chalapathi Rao a tribal farmer from hilly region expressed that only source of irrigation is rainwater, which is major problem for them to irrigate during summer months. He was happy to share that financial assistance from NABARD and FPO's have helped them to install small scale processing units.

Shri. N. Ravi, farmer from plain areas of the W. Godavari district, said that cultivation of improved varieties from Bapatla and VRI-3 has helped them to get more yield and fetch higher returns. Only problem faced by them is blossom blight which is noticed in recent times due fluctuation in weather.

Shri. Ramana Reddy from Gopalapura village, a progressive farmer who received best farmer award recently from DCCD, expressed that he shifted cultivation of cashew from tobacco due to loss incurred. He is happy with the performance of Bapatla varieties in their village. Only problem faced recently is of gummosis where he lost few plants. Later he could recover his plantation by organic cultivation and management practices.

Shri. Laxmi Narayana, farmer shared that he stared following package of practice from the University, which has helped him to get good flowers and he is expecting good yield this year.

Mr. Devadanam, Horticulture officer from Dwaraka Tirumala, expressed that even in younger tress of 8-10 years CSRB infestation is being noticed. Due to shortage of labors to pick and separate fruits, he requested the scientists to come up with equipments to separate nuts from fruits. He also requested the house to get MSP for cashew.

Dr. L. Naram Naidu, Director of Research, Dr. YSRHU, V.R. Gudem in his remarks thanked farmers, department officers, and scientists of HRS, Bapatla, for popularizing their varieties and technologies and its impact in farmers' field.

General recommendations from the session:

Dr V.B. Patel, ADG (Fruits and Plantation Crops), ICAR, New Delhi, pointed out that farmers from new cashew orchards in hilly areas should be given proper training in organic cultivation and natural farming. He also said that effective control measures towards control of CSRB, blossom blight and gummosis need to be given. He suggested ICAR-DCR Puttur, to compile data from all states who are giving MSP for cashew and send a proposal to ICAR, New Delhi to bring it to the notice of Central government for its consideration.

Dr. J.D. Adiga Director, ICAR-DCR, Puttur, expressed that experiments on new molecules need to be carried out to control TMB, CSRB, gummosis and blossom blight in cashew. He pointed out that farmers should have FPO's in their village and think of having a small scale processing units with financial assistance from NABARD, Central and State govt., to avoid middlemen and get higher returns for their produce. He also suggested that farmers who are practicing organic cultivation, certification of their land from respective agencies should be done in order to sell organically grown cashew at higher rates. He assured that in 2-3 years equipments for fruit picking, apple and nut separator and drone technology will be made available to the farmers.

Dr. P. C. Lenka Former Professor OUAT, Bhubaneswar, suggested farmers from tribal areas, who grow cashew organically should think of growing cashew in clusters so that it would be helpful for them to fetch higher price.

PLENARY SESSION

Chairman	:	Dr. V. B. Patel, ADG (Fruits and Plantation crops), ICAR, New Delhi
Rapporteur	:	Dr. Srikantaprasad D, HREC, Hogalagere

Dr. V. B. Patel, ADG (Fruits and Plantation crops) chaired the session. Dr. J. Dinakara Adiga, Director of ICAR-DCR Puttur, Dr. Tolety Janakiram, Honourable Vice Chancellor, Dr. YSRHU and Dr. Naram Naidu, DR, Dr.YSRHU were the other dignitaries on stage.

Mrs. Asna AC presented the general recommendations from crop improvement session, while Dr. Palanikumar presented recommendations from crop management session and Dr. Nagendra Reddy presented the recommendations from crop protection session. The reports of Variety release session and Interaction sessions were presented by Dr. Asna AC and Dr. Naveen Puttaswamy, respectively.

Dr. V.B. Patel congratulated Dr. T. Janakiram for the development of Dr. YSRHU, technologies. In his remarks he made following suggestions to be taken up by the concerned.

- To obtain IC number for unique accessions with assistance from the PC cell (Action: All scientists and PC cell).
- To organize training from NBPGR for crop improvement scientists (Action: PC Cell)
- Proper parent selection for crossing (Action: All Crop improvement Scientists and PC cell) followed by selection of minimum 100 nuts per cross per year for further evaluation.
- Yield should not be expressed as just kg per plant or ton per ha basis but also in kg per m^3 of the canopy (Action All scientists)
- All the varieties released in the present AGM should obtain IC number and submitted further with DNA finger prints (Action: Scientists involved)
- To assign one scientist for one experiment for effective presentation (Action: PC Cell)

Dr. B. Srinivasulu, Former Director of Extension and Head HRS, Ambajipet recommended the following.

- To maintain all the released varieties in one block at each AICRP centres (Action: Heads of All AICRP Centres)
- To validate farmers' technologies (Action: All Scientists)

Dr. J. Dinakara Adiga, Director, ICAR-DCR, Puttur thanked the authorities of Dr. YSRHU for their hospitality and congratulated the centres which had released new varieties. He briefed about all the sessions and thanked the Experts of the Session for their valuable advice.

Dr. T. Janakiram, Hon'ble Vice Chancellor, Dr. YSRHU thanked the office bearers of ICAR for providing an opportunity to host the AGM-2022 at Dr. YSRHU. In his remarks, following suggestions were highlighted.

- To compile the recommendations of last five years AGMs and to review the adoptions (Action: PC Cell)
- To set seed standard for varieties by constituting a committee (Action: ICAR-DCR, Puttur)
- To classify recommendations of AGM as research related and policy related (Action: PC Cell)
- To communicate the researchable issues on cashew to universities to make them as topics for student research programme (Action: PC Cell)
- To keep the note of charges by PPVFRA while registering variety
- Identification of ICAR-KVKs in cashew growing areas to form FPOs in the respective cashew growing areas (Action: PC Cell)
- To conduct National level exhibition on cashew including post harvest handling (Action: PC Cell)
- To conduct survey on impact of technologies especially varieties (Action: PC Cell)
- To conduct tribal oriented meeting on cashew (Action: PC Cell)
- To recognize ground level workers like technical assistants and malis in AGMs (Action: PC Cell)

The CRS, Madakkathara was honoured with Best AICRP Centre award. Later technical staff and Malis of CRS, Bapatla and HRS, VR Gudem were felicitated.

Minutes of the Zoom meeting held on 24.01.2023 to finalize the AICRP Cashew Crop Protection Experiments

Chairman	:	Dr. T. N. Raviprasad, Principal Scientist (Agrl.Entomology), ICAR-DCR, Puttur
Co- Chairman	:	Dr. K. Vanitha, Senior Scientist, (Agrl.Entomology), ICAR-DCR, Puttur
Rapporteurs	:	Dr. B. Nagendra Reddy, Scientist (Ento.), CRS, Bapatla Dr. Nasiya Beegum A. N., Scientist (Ento.), CRS, Madakkathara

Experiments on Crop Protection allotted to different centers viz.,

Expt.1 Evaluation of insecticides for the control of Tea Mosquito Bug and other insect pests.

Expt.1a. Evaluation of botanicals for the control of Tea Mosquito Bug and other insect pests.

Expt.2 Curative Trial (Post extraction prophylaxis) for management of Cashew stem and root borer (CSRB)

Expt.3 Influence of biotic and abiotic factors on the incidence of pest complex of cashew

Expt.4 Screening of germplasm to locate tolerant/resistant types to major pests of the region.

Expt.5 Documentation of flower visitors and pollinators of cashew in various agro ecological regions

Expt.1 Evaluation of insecticides for the control of Tea Mosquito Bugs and other insect pests.

- The following treatments are approved for conducting this experiment across the centers :

  T_1 : Thiamethoxam 25 WG @ 0.2 g/L
  T_2 : Imidacloprid 200 SL @ 0.3 ml/L
  T_3 : Carbosulfan 25 EC @ 2.0 ml/L
  T_4 : Thiacloprid 25 SC @ 1.5 ml/L
  T_5 : Lambda-cyhalothrin 5 EC @ 0.6 ml/L
  T_6 : POP recommendation by respective University
  T_7 : Untreated Control

- The treatments along with respective treatment number should be uniform across the different centers for easy compilation and formulating the recommendation.
- The experimental design to be followed will be RBD, with 3 replications and minimum of 2 plants per replication (i.e., minimum of six plants per treatment)
- The observations on pest incidence (TMB and 4 major pests of the region ONLY) should be recorded on 7 DAS and 15 DAS. Each center should identify the major pests of the region and conduct this experiment for only 4 major pests of the region and details of the pest need to be communicated to DCR.

- Based on the pest population crossing the ETL *i.e.* > 5.0 per cent incidence in laterals by TMB or > 5.0 per cent damage for other important pests of the region, if TMB infestation is not noticed, the treatments shall be imposed subsequently.
- Before every spray, pre-treatment observations of the pest species should be recorded and spray taken up on the next day itself.
- As Paria center reported good control of TMB with Buprofezin 25 SC treatment, this center should conduct the laboratory trials with Buprofezin 25 SC to know its efficacy against TMB and present the results in next Annual Group Meeting along with good photographs of the deformed insects.

Expt.1a. Evaluation of botanicals for the control of Tea Mosquito Bug and other insect pests.

- The following treatments are approved for conducting of this experiment across the centres

T_1 : Azadirachtin 1% @ 1.0 ml/L
T_2 : NSKE @ 5 %
T_3 : Novel plus 10 %
T_4 : Region-specific botanicals specific to the center (that gave good result in previous years)
T_5 : Region-specific botanicals specific to the center (that gave good result in previous years)
T_6 : Lambda-cyhalothrin 5 EC @ 0.6 ml/L
T_7 : Untreated Control

- Experimental design: RBD, with 3 replications and minimum of 2 plants per replication (ie., minimum of 6 plants per treatment)
- Imposition of treatments at 15 days interval
- The observation should be recorded on 7 and 15 days after spraying
- Before every spray, pretreatment observations should be recorded
- Each centre should select 4 (four) major pests of the region and conduct this experiment for only the identified major pests of the region.

Expt.2 Curative Trial (Post extraction prophylaxis) for management of Cashew stem and root borer

- This trial shall continue with the same set of treatments for further 2 years
- Physical parameters of treated cashew trees recorded till date may be compiled and submitted to the PC cell.

Expt.3 Influence of biotic and abiotic factors on the incidence of pest complex of cashew

- In this experiment, incidence of major pest of the region should be correlated to the meteorological standard week; prior to observation and NOT to the current standard week of observation.
- Pest incidence data should be presented through graphical representation.
- No need to correlate the CSRB incidence in this experiment; however, the number of infested trees may be recorded and presented month-wise. If possible, the numbers and relevant stage of CSRB grubs / infested tree shall ALSO be recorded and presented in AGM on a monthly basis.
- Recording and identification of any natural enemies including spiders should be done through authentic means, up to species level.
- The species of apple and nut borers occurring should be documented.
- Observation on incidence of leaf thrips and flower thrips must be done separately.

Expt.4 Screening of germplasm to locate tolerant/resistant types to major pests of the region.

- Compile the performance of germplasm data [indicating the accessions OR germplasm which often / consistently display tolerance to any pest] documented from the respective centre and should be submitted to PC cell.
- Focus should be on screening for 4 /5 major regional pests
- Screening of the new germplasm may be done only for pest reaction instead of yield parameters under crop protection trials

Expt.5 Documentation of flower visitors and pollinators of cashew in various agro ecological regions

- Sweep nets are to be used to collect flower visitors and pollinators. If bee bowls are used, the data should be presented separately, as their flora may not be cashew alone.
- Identify the flower visitors like bees, wasps, flies, ants, butterflies etc., up to species level with the help of taxonomists.
- New experiment on pollinators on cashew is approved for 9 centers viz., Bapatla, Bhubaneswar, Vridhachalam, Madakkathara, Paria, Kanabargi, Hogalagere, Vengurla, Jagdalpur. Dr. K. Vanitha, Senior Scientist (Agrl. Entomology) will be providing the data recording format to all these centres.
- To document the flower thrips across the centres, all centres should collect the flower thrips in specified media (mailed earlier) and send to Dr. K. Vanitha, Senior Scientist, (Agrl. Entomology), ICAR- DCR, for further needful.

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Title: Documentation of flower visitors and pollinators of cashew in various Agro-ecological regions.

Methodology to be followed for insect collection and recording the observations.
(Observations to be recorded preferably in unsprayed plots or 1 week after insecticidal sprays).

1. **Documentation of flower visitors of cashew (during 1st and 2nd year of experiment)**

- Bee bowls/ visual counts/ sweep nets/ pan traps shall be used to collect the flower visitors and bees occurring on the cashew inflorescences. If bee bowls and pan traps (of Red, yellow, blue, green colour) are used, the details of collected insects should be presented separately.
- Transect sampling shall be done in the cashew plantations at possible periodic intervals from morning till evening to collect the insects on inflorescences during the flowering season of cashew.
- Preservation and identification of the insects should be taken care properly. Authenticated identification is very important: Experts in NBAIR / IARI / GKVK / pollinator experts should be contacted for identification.
- Good photographs should be taken on each species (before pinning) and sent to SIC (PC Cell), ICAR-DCR, Puttur with a copy to Dr. K. Vanitha, Senior Scientist (Agricultural Entomology) for the reference.
- Observations like number of each species in total collection, whether the insect collects pollen or nectar or just visits/ hovers over the flower without touching the reproductive parts of flowers especially the stigma on hermaphrodite flowers etc. to be recorded.
- Further, information on insects visiting to male or bisexual flower, collects pollen or nectar, extra floral nectar (which is the preferred foraging reward) may also be recorded.

2. **Documentation of pollinators of cashew (From 2nd year of experiment)**

- The flower visitor may be categorized as pollinator based on its foraging behaviours as mentioned above.
- The foraging hours of each prominent pollinator species should be recorded (The time period from when the initial bee activity is observed on cashew flowers and until the time period it is observed in the evening). The peak foraging hours refers to the period exhibiting maximum bee activity on cashew flowers. Other details like foraging rate and foraging speed should be recorded for the prominent pollinator species.
    - Foraging Rate: The number of flowers visited by important species per trip in vicinity at peak foraging hour.
    - Foraging speed: Time spent on each flower at peak activity (Free, 1993).

3. Relative abundance of pollinators (During 2nd and 3rd year of experiment)

- Select random spots having more inflorescence in a particular site. Observations can also be made variety wise, only if possible (one or two promising varieties).
- Observation to be made at regular time intervals of one hour from 8.00 am till 6.00 pm. For eg., 8.00 am to 9.00 am, 9.00 am to 10.00 am etc., till 5.00 pm to 6.00 pm.
- When cashew is at full bloom stage, the total number of different pollinators visiting on ten inflorescences to be observed at a time continuously for 10 min at hourly intervals from 8.00 am till 6.00 pm. The observations should be made for each time interval during 10 different days and the mean must be calculated for each time interval.
- The relative abundance of each species/group to be calculated in relation to total species.
- Additionally, the same observations can be recorded during initial flowering season, mid flowering season and late flowering season in a particular region. Like Nov-Dec (initial), Jan-Feb (mid) and Mar-Apr (Late) for Puttur condition. *This particular observation during initial, mid and late flowering season is only optional* to the interested centres, while observation during full bloom stage is to be recorded by all the centres.

4. Utilization of simple artificial bee nests for checking its suitability to stem nesting bees of particular region (From 2nd year onwards)

- The artificial bee nests comprising small wooden blocks with drill holes at one side (1 x1 cm apart of 6 cm deep holes (if possible, make deeper holes also, but the drill hole and entrance should be smooth), different sized holes with diameter of 2.0 mm to 4.0 mm) can be made and the blocks can be kept over an ant well stand.
- Along with drilled wooden blocks, thin sticks of plant species having hollow stems or soft pith for eg., bamboo culms, Lantana, Mussanda, Johnson grass, cashew, *Caesalpinia* sp. etc) can be cut into pieces of 20-25 cm length and they can be made as small bundles and kept over an ant well stand and protect from direct sun and rain. Minimum of three different plant types can be utilized in this to understand the nest preferences of bees.
- This nest structure can be kept close to cashew plants under shade. Nest occupation by the bees should be observed periodically. Care must be taken to keep away ants by maintaining sufficient water in the ant well.
- Along with bees, many wasp species also tend to occupy these nests. Record the occupants at three-months intervals.

(Please refer the research paper on "Artificial nests conserve important native bees, *Braunsapis* spp. pollinating cashew" published by K. Vanitha and T.N. Raviprasad in *Current Science*, 2021, Vol 10 (1) for more understanding.

5. **Recording the common bee flora and the bee species visiting them (This observation is optional to the centres - can be recorded from 2nd year onwards).**

   - The common bee flora including weed species (please get correct plant species identity) in and around cashew plantations and the pollinator species attracted to them should be documented during flowering and non-flowering period of cashew.

   - This information helps to understand the common flora that are supporting the life of pollinators especially during honey-dearth period, and also further helps to develop suitable conservation measures for the pollinators.

Outcome:

- Record of flower visitors of cashew in different agro-ecological regions of India.
- Record of pollinators of cashew and their relative abundance.
- The common bee flora and the record of bee species visiting them in different cashew growing regions.
- The occupancy in bee nests give a clue of stem nesting bees in the region and their preference towards nesting substrates, which can be utilized for conservation of bee species.

Tables to be presented during AGM by the AICRP C:

1. Flower visitors of cashew at ….. region (1st year)

Sl.No.	Common name	Scientific name	Family	Order
1				
2				
3				
4				
…				

1a. Flower visitors of cashew at ….. region (1st year

Sl.No.	Scientific name	Visits male or bisexual flower or both (preference)	Foraging reward
1		Eg. Male > female > a day old flowers ….	Eg. Pollen > nectar> extra floral nectar
2			
3			
4			
…			

2. Pollinators of cashew in … region and their foraging behaviour (2 and 3 year)

Sl.No.	Scientific name	Foraging hours	Peak foraging hours	Foraging speed	Foraging rate
1					
2					
3					
4					
…					

3. Relative abundance of important pollinators of cashew in …. region (2 and 3 year)

Timings	Relative abundance of pollinators (%)							
	Species 1	2	3	4	5	6	7	8 …

8- 9 am								
9-10 am								
…								
….								
4-5 pm								
5-6 pm								

4a. Occupancy of stem nesting insects in the artificial nests – wooden blocks

Nest occupancy after installation of nests (Wooden blocks with drilled holes)					
Months after installation	Total number of nests (i.e., no of holes made)	Number of nests occupied		% Occupancy	
		Bees	Other insects (wasps)	Bees	Other insects (wasps)
3	2 mm dia. – Nos				
	3 mm dia. – Nos				
	4 mm dia. – Nos				
6					
9					

12 So on…					

4b. Occupancy of stem nesting insects in the artificial nests - Plant sticks with pithy stems/ hollow

Nest occupancy after installation of nests (Plant sticks with pithy stems/ hollow)					
Months after installation	Total number of nests (i.e., no of sticks provided)	Number of nests occupied		% Occupancy	
		Bees	Other insects (wasps)	Bees	Other insects (wasps)
3	Eg., Bamboo - Nos				
	Mussanda - Nos				
	Johnson grass – Nos				
6					
9					
12… so on…					

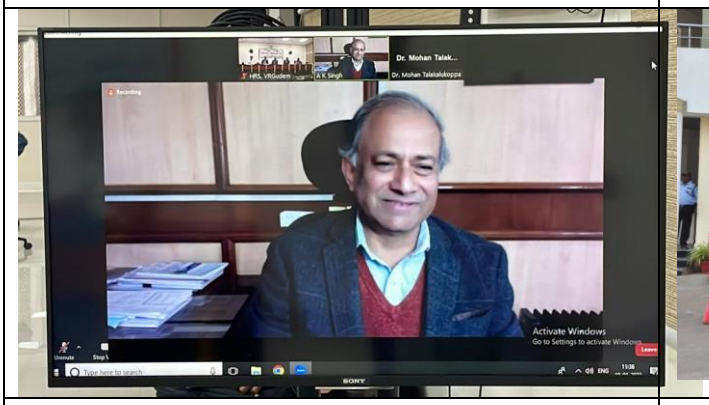
4. The common bee flora and the pollinator species visiting upon in …. region

Sl. No.	Scientific name of plant with family	Scientific name of prominent pollinator / bee species	Season of visit (Months)
1		1	
		2	
		3…. so on	
2		1	
		2	
		3 so on	

GLIMPSES OF THE ANNUAL GROUP MEETING

Inauguration of the AGM - 2022

Release of Publications



Address by Dr. A.K. Singh, DDG (Horti. Sci.), ICAR, New Delhi

Participants in the AGM - 2022

CRS, Madakkathara awarded as the Best AICRP-C Centre for the year 2022

Interaction Session

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